PROVISIONAL INTELLIGENCE REPORT

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IRON ORE IN THE SOVIET BLOC

CIA/RR PR-93

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ECONOMIC INTELLIGENCE REPORT

IRON ORE IN THE SOVIET BLOC

CIA/RR PR-93

(ORR Project 23.172)

CENTRAL INTELLIGENCE AGENCY

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IRON ORE IN THE SOVIET BLOC*

Summary and Conclusions

The Soviet Bloc** as a whole, including Communist China, is virtually self-sufficient in iron ore and therefore is not vulnerable to economic warfare designed to cut off ore shipments from the West. Estimated total iron ore production in the Bloc during 1953 amounted to about 75.1 million metric tons*** (iron content 50 percent),**** which represents 96.7 percent of the estimated Bloc ore consumption. The existing 3.3 percent ore deficit now supplied to the European Satellites by the West could, in the event of a blockade, be produced in the USSR.

The USSR is second only to the US as a producer of iron ore. In 1953 the USSR produced an estimated 66.7 million tons (iron content 50 percent). Iron ore production is generally deficient in the European Satellites, and restrictions on inter-Bloc commerce imposed by many Western nations made it necessary to import about 7 million tons of ore (iron content 50 percent) from the USSR in 1953, or about 40 percent of Satellite ore requirements. It is anticipated that by 1955 the USSR will supply the European Satellites with at least 8 million tons of iron ore (iron content 50 percent).

Communist China is a surplus iron ore producer and could raise substantially its production to meet the needs of an expanding domestic iron and steel industry as well as to increase exports. Estimated iron ore production in Communist China during 1953 amounted to 4.8 million tons (iron content 50 percent). Present indications place 1955

* The estimates and conclusions contained in this report represent the best judgment of the responsible analyst as of 15 October 1954.

** See the map, Soviet Bloc: Principal Iron Mining Centers, inside back cover.

*** Throughout this report, tonnages are given in metric tons.

**** Where not specified, the iron content of the iron ore is unknown.

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ore production at about 7.5 million tons (iron content 50 percent). An exportable surplus of 3 million tons (iron content 50 percent) could be produced with little difficulty. The estimated production and consumption of iron ore in the Soviet Bloc, by country, in 1953 are shown in Table 1.*

The total of proved and probable iron ore reserves in the Soviet Bloc believed suitable for exploitation without extensive beneficiation has been estimated at 12 billion tons, and it is quite probable that this figure will increase as exploration continues. Approximately 86 percent of these reserves are located within the USSR, while Communist China contains 8 percent of the total, and the balance (6 percent) is divided among the European Satellites, with Czechoslovakia and Poland possessing the largest shares. In addition to these reserves, the USSR has tremendous quantities of low-grade iron ores, including iron quartzites, the exploitation of which has only recently been made possible. The development of new and improved beneficiation techniques would render more of these ores serviceable to the iron and steel industry.

Iron ore beneficiation is the principal limiting factor of the future iron ore production plans of the USSR. Of more immediate necessity than the beneficiation of the iron quartzite reserves mentioned above is the development of an efficient over-all program to beneficiate the iron ores which are now being extracted from the largest deposits in the country. The tenor and physical quality of these ores is known to be declining, resulting in the creation of new problems and difficulties throughout the industry. In the Satellites as well, particularly in Poland and Communist China, the importance of ore beneficiation is becoming ever more apparent. Thus, for the entire Soviet Bloc the cost per ton of iron ore mined is steadily increasing. Many ore processing plants have already been built in the USSR, but additional substantial investments of this nature must be made before the iron and steel industry can be assured of a steady supply of uniform-quality ore. The Soviet iron ore industry, although saddled with the increasing requirements of the Satellites, appears reluctant to import foreign iron ores, even though such a course of action might be economically more feasible in some areas than utilization of domestic low-grade ores.

* Table 1 follows on p. 3.

If the growth of the iron ore mining industry of the Soviet Bloc follows the predicted rate of expansion, presently credited reserves may be expected to guarantee self-sufficiency for at least 125 years.

Table 1

Estimated Production and Consumption of Iron Ore in the Soviet Bloc, by Country a/ 1953

Country	Production (Thousand Metric Tons)	Percent of Total	Consumption (Thousand Metric Tons)	Percent of Self-Sufficiency
USSR	66,700	88.76	59,800	111.54
Communist China	4,846	6.45	4,596	105.44
Czechoslovakia	1,518	2.02	4,920	30.9
Poland	660	0.88	4,270	15.5
East Germany	730	0.97	2,412	30.3
Hungary	279	0.37	1,088	25.6
Rumania	368	0.49	635	58.0
Bulgaria	47	0.06	0	100.0
Albania	Negligible		0	100.0
Total	75,148	100.00	77,721	

a. Iron content 50 percent.

I. USSR.

A. Introduction.

The USSR, like the US, is faced with the problem of having to beneficiate iron ores to a greater degree than formerly because of the increasingly poor quality of the ores mined. In fact, the greatest single problem facing the iron ore mining industry of the USSR is that of providing beneficiating facilities for its ores. The iron ore mined

in the USSR must undergo processing in order to improve its chemical composition or its physical quality before it is charged into the blast furnaces. The principal processing methods used are crushing, screening, washing, roasting, magnetic concentration, and agglomeration -- or sintering. The processes of magnetic concentration and agglomeration play a more important role in the production of iron ore in the USSR than in the US. In the efforts of the Satellite countries to utilize finely divided iron ores which have been supplied by the USSR, it has frequently become necessary to erect sintering plants in which to condition the ore in order to make it physically suitable for charging into blast furnaces.

Soviet geologists divide the mineral resources of the USSR into two categories according to the amount of geological information available concerning them and the degree to which they are prepared for industrial development. The first category is usually called "proved reserves," that is, reserves which have been studied and surveyed sufficiently for practical development. The second category of reserves is usually called "probable reserves." This category indicates only that an appropriate mineral has been discovered; not enough is known to characterize it either in regard to chemical composition or technological properties. This category is expressed quantitatively not on the basis of the results of exploratory work, but on the basis of geologic assumptions. Obviously the proved reserves are those which are of interest for the practical requirements of the national economy, while the probable reserves are used for planning further geologic study.

In considering the economics of the iron ore situation in the Soviet Bloc it must be remembered that factors which would influence practice in the West do not always hold true in the Bloc. For example, iron ore is shipped by railroad more than 500 miles to the blast furnace plants of East Germany and Poland, and nearly as far to other Satellite states. Within the USSR the average rail haul of iron ore from mine to consumer is 376 miles. In the US, primarily because of the availability of cheap water transportation, the average rail haul is less than 200 miles. Also, in the Soviet Bloc low-grade ores and small deposits (which would be bypassed in more iron-rich economies) are exploited under the pressures of industrial development and a policy of self-sufficiency.

Before the First Five Year Plan began in 1928 the lack of a comprehensive survey of the ore reserves of the USSR prohibited any

systematic development and expansion of the iron ore mining industry. During the early 1930's the aid of foreign consultants was enlisted by the Soviet government to determine more accurately the extent and quality of the known iron ore deposits in the European USSR (including the Ural Mountains) and, if possible, to discover any significant new deposits which might exist. On the basis of their findings it became clearly apparent that the Ukraine (Region III*) and the Ural Mountains (Region VIII) were to be the principal iron ore producing areas of the USSR for many decades.

Iron ore production in the USSR rose steadily from 6.1 million tons in 1928 to 29.8 million tons in 1940. 1/** Approximately 70 percent of the 1940 production area was overrun by the invading German army at one time or another during World War II. 2/ Rehabilitation of the war-ravaged facilities began in 1944, and by the end of the Fourth Five Year Plan in 1950 the task was basically completed. 3/ Concurrent with the rehabilitation program in the Fourth Five Year Plan a considerable expansion and modernization of ore mining facilities took place, thus enabling the Soviet iron mining industry to achieve its 1950 production goal of 40 million tons of processed ore. 4/

B. Reserves.

Although it is difficult to determine whether the Soviet classification of reserves is comparable to that of other countries, the USSR is known to occupy a prominent position in relation to the iron ore resources of the world. As of 1 January 1938 the probable reserves of magnetite, hematite, limonite, and other workable iron ores were estimated to be about 10.9 billion tons, with an over-all average iron content of 45 percent.*** Of this total, approximately 4.5 billion tons were classified as proved or actual reserves. In addition

* The term region in this report refers to the economic regions defined and numbered on CIA Map 12048.1 (9-51) (First Revision, 7-52), USSR: Economic Regions.

** Footnote references in arabic numerals are to sources listed in Appendix E.

*** The data issued by the Union Geological Fund (VGF) of the USSR in 1938 pertaining to Soviet iron ore resources are the most recent official statistics available. Any more recent country-wide survey of iron ore reserves which may have been made has not yet been released to the Soviet public. Fragmentary iron ore reserve estimates, which have occasionally appeared in post-World War II publications in the USSR, appear to have been derived directly or indirectly from the data issued in 1938.

to these reserves, there are extensive deposits of iron quartzites,* estimated at 256.7 billion tons, of which 11.6 billion tons have been classified as proved.

From the standpoint of quality, the iron ore reserves of the USSR range from the high-silica, low-iron quartzites of the Kursk Magnetic Anomaly (Region VII) to the top-grade hematites of the southern Ukraine, which are roughly similar to our own Mesabi range ores of Minnesota. About half of the nonquartzite reserves are limonite, roughly 30 percent are magnetite, and almost 20 percent are hematite. The latter two types of ore are the most important for metallurgical purposes and occur chiefly in the Urals and the Ukraine.

It is believed that there was no significant change in known total Soviet iron ore reserves between 1 January 1938 and the outbreak of World War II. Exploration and prospecting continued into and through the war years on a limited scale, and operations expanded considerably in the postwar period. Since the war, many of the iron ore deposits of the Urals and Asiatic USSR, of which little was known, have been more thoroughly prospected. As a result, a number of these deposits have become potentially important sources of iron ore for existing and planned metallurgical plants. Detailed information on new discoveries is lacking.

The Fifth Five Year Plan (1951-55) continues the pattern set by the Fourth Five Year Plan (1946-50) in that it calls for continuation of the surveying of existing deposits to increase proved reserves and continued exploration for new reserves, particularly in Central Asia, Siberia, and the Far East.

Available evidence indicates that the total proved reserves of the USSR are presently at least equal to and probably greater than the best available prewar figures, despite the increased rate of extraction during the past 16 years. The over-all quality of the ores has declined steadily, however, both in chemical composition and

* Iron quartzites are iron-bearing rocks that are in most cases too low in iron content to be workable under present economic conditions. These quartzite ores, however, are an additional source of iron which can be resorted to when deposits of more workable ores are depleted. There is information indicating that the Russians are already processing these quartzites at Krivoy Rog and Bakal. 5/

physical structure. The Soviet claim to the possession of the greatest iron ore reserves in the world apparently does not make allowances for iron content and is probably based on the inclusion of iron quartzite deposits. Theoretically proved reserves of workable iron ore in the USSR could support the 1950 Soviet pig iron production rate of 19.5 million tons for about 90 years, while the 1960 pig iron production goal of 50 million tons could be maintained for about 35 years.

Iron ore deposits have been found in nearly all parts of the country, and about 600 deposits contained proved reserves. Of these, however, only about 100 have been exploited. The most important deposits in the USSR are those in the Krivoy Rog basin, in the Ukrainian SSR (Region III). They are the richest large deposits now being worked and will remain so for many years. These deposits have been estimated to contain 1 billion tons of 50-percent iron content or better. In addition to the high iron content these ores have other favorable properties, such as a low content of silica, phosphorus, and sulphur. The fine, powdery nature of the ores, however, is a distinct hindrance to their utilization.

The Ural Mountains (Region VIII) contain about 60 percent of all iron ore reserves in the eastern part of the USSR. Some 200 iron ore deposits are known to exist within the region. The total probable reserves are given as more than 2.4 billion tons, of which 1.17 billion tons are classified as proved ore. These deposits are characterized by the exceptional purity of some of the ores (primarily the Bakal ores), as well as by the alloying admixtures of others (Vysokaya, Blagodat', Orsk, and so on). Outstanding concentrations of iron ore are located in the Bogoslovskiy, Tagilo-Kushva, Alapayevsk, Bakal, Magnitogorsk, Beloretsk, and Khalilovo areas.

The largest iron ore deposit in the USSR is located at Kerch', in the eastern part of the Crimean peninsula (Region III). Total reserves are believed to be in excess of 2.7 billion tons. The average iron content is rather low, ranging from 30 to 40 percent, but the favorable occurrence and geographic location of the Kerch' deposit make it the most economical to exploit of all iron ore deposits in the country. 6/ The presence of vanadium (a valuable admixture metal which imparts certain favorable qualities to steel) in the Kerch' ore is of considerable significance. Though vanadium is present only in the amount of 0.07 percent, the enormous size of the deposit makes it a potentially important source of vanadium.

Deposits of iron ore in central European Russia (Region VII) have a particular importance, because of their proximity to Moscow, Leningrad, and other industrial centers of the region. The most important deposits are the Kursk Magnetic Anomaly and the Tula and Lipetsk deposits. The position of the Kursk Magnetic Anomaly is especially favorable, as it is located between the Moscow (Region VII) and Donetz (Region III) coal areas and is closer to many of the metallurgical centers of the Donetz area than is Krivoy Rog. 7/ The deposit consists of 336.7 million tons of high-grade iron ore, accompanied by tremendous reserves of low-grade iron quarczites. In spite of these favorable factors, complicated hydrogeological conditions and an intricate chemical composition have hampered a large-scale exploitation of these ores up to the present time. The Soviet government has devoted considerable time and effort in recent years to the development of an economical method of exploiting the Kursk deposit, but thus far it has apparently been unsuccessful.

Other iron ore deposits in the USSR which are important because they support local steel industries are the Dashkesan deposits (Region V), the Gornaya Shoriya deposits (south of Stalinsk, in Region IX), the Abakan and Balyaginskiy deposits (Region XI), and the Nikolayevsk deposit (Region XII). 8/ The estimated reserves of iron ore in the USSR, by region, in 1938 are shown in Table 2.* The estimated reserves of iron quartzites in the USSR, by region, in 1938 are shown in Table 3.**

C. Production.

Production of iron ore in the USSR has risen steadily since the end of World War II. The outstanding achievements accomplished by the iron mining industry during the period of the Fourth Five Year Plan were the complete rehabilitation and extensive modernization of the mines in the Krivoy Rog Basin and the fulfillment of the Five Year Plan production goal for 1950 of 43.5 million tons of iron ore (iron content 50 percent) for the USSR. 9/

So far, in the Fifth Five Year Plan, the yearly rate of iron ore production has continued to rise steadily. Though the Krivoy Rog mines, the major source of iron ore in the USSR, were lagging behind their scheduled norms early in the year, the 1953 over-all Plan for

* Table 2 follows on p. 9.
** Table 3 follows on p. 10.

Table 2

Estimated Reserves of Iron Ore in the USSR, by Region a/
1938

Region	Probable Reserves (Million Metric Tons)	Percent of Total Probable Reserves	Proved Reserves (Million Metric Tons)	Percent of Total Proved Reserves
North and Northwest (I)	1,065.0	9.8	27.8	0.6
West (II)	0	0	0	0
South (III)	4,213.5	38.7	2,306.7	51.2
Southeast (IV)	115.4	1.1	37.2	0.8
Transcaucasus (V)	200.4	1.8	177.9	4.0
Volga (VI)	716.0	6.6	184.4	4.1
Central (VII)	821.4	7.5	394.7	8.8
Urals (VIII)	2,414.6	22.2	1,168.5	25.9
West Siberia (IX)	414.5	3.8	71.8	1.6
Kazakhstan and Central Asia (X)	118.7	1.1	11.1	0.3
East Siberia (XI)	707.1	6.5	110.1	2.4
Far East (XII)	93.6	0.9	15.0	0.3
Total	10,880.2	100.0	4,505.2	100.0

a. Compiled from data issued by the Union Geological Fund (VGF) of the USSR in 1938-39.

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Table 3

Estimated Reserves of Iron Quartzites
in the USSR, by Region a/
1938

Million Metric Tons

Region	Probable Reserves	Proved Reserves
North and Northwest (I)	531.2	106.9
West (II)	0	0
South (III)	51,344.0	10,572.0
Southeast (IV)	0	0
Transcaucasus (V)	0	0
Volga (VI)	0	0
Central (VII)	203,744.5	858.0
Urals (VIII)	0	0
West Siberia (IX)	29.1	0
Kazakhstan and Central Asia (X)	64.5	0
East Siberia (XI)	310.7	9.1
Far East (XII)	646.1	41.2
Total	256,670.1	11,587.2

a. Compiled from data issued by the Union Geological Fund (VGF) of the USSR in 1938.

iron ore extraction was reportedly overfulfilled. 10/ Although according to custom, no statistics were given, it is estimated that 66.7 million tons of iron ore were produced in 1953. This places the USSR second only to the US as the leading iron ore producer of the world. 11/ The estimated production of iron ore in the USSR in 1913, 1920, and 1928-55 is shown in Table 4.* The estimated production of iron ore in the USSR, by region, in 1940, 1946, and 1950-55 is shown in Table 5.**

The overwhelming portion of Soviet iron ore production is centered in two regions, the southern Ukraine (Region III) and the Ural Mountains (Region VIII). These two areas accounted for 94 percent of the total iron ore production of the USSR in 1940, 12/ 91 percent

* Table 4 follows on p. 11.
** Table 5 follows on p. 12.

Table 4

Estimated Total Production of Iron Ore in the USSR a/ b/
1913, 1920, and 1928-55

Thousand Metric Tons

Year	Production	Year	Production
1913	10,000	1941	22,700
1920	166	1942	8,500
1928	6,100	1943	9,700
1929	8,000	1944	12,000
1930	10,700	1945	16,600
1931	10,600	1946	20,000
1932	12,100	1947	25,000
1933	14,500	1948	30,000
1934	21,500	1949	35,000
1935	26,800	1950	43,500
1936	27,900	1951	51,200
1937	27,800	1952	59,000
1938	26,500	1953	66,700
1939	28,000	1954	74,500
1940	29,800	1955	82,200

a. For 1913-20, see 13/; for 1928-49, see 14/; for 1951-55, see Appendix C, Methodology.
b. Iron content of ore produced before 1950 is unknown. Iron content of ore produced in 1950-55, 50 percent.

of total production in 1946, 15/ and 88 percent of total production in 1953. 16/ West Siberia (Region IX), Central Russia (Region VII), and the Transcaucasus (Region V), in order of importance, accounted for most of the balance of Soviet iron ore production in 1953. 17/ In spite of the small portion of production represented by these latter deposits, they are important because they serve as sources of raw material for local iron and steel plants.

The Krivoy Rog Basin and the Kerch' district, on the Crimean peninsula, are the iron ore producing areas in the southern Ukraine. Krivoy Rog, except for the occupation years of World War II and the rehabilitation period that followed, has long been acknowledged as the

Table 5

Estimated Production of Iron Ore in the USSR, by Region
1940, 1946, and 1950-55

Thousand Metric Tons

Region	1940 a/ 18/ Production	Percent of Total	1946 a/ 19/ Production	Percent of Total	1950 b/ 20/ Production	Percent of Total	1951 b/ c/ Production	1952 b/ c/ Production	1953 b/ c/ Production	1954 b/ c/ Production	1955 b/ c/ Production
North and North-West (I)	0	0	0	0	0	0	0	0	0	0	0
West (II)	0	0	0	0	0	0	0	0	0	0	0
South (III)	20,090	67.4	6,360	31.8	22,620	52.0	26,620	30,680	34,680	38,740	42,740
Southeast (IV)	0		0	0	0	0	0	0	0	0	0
Transcaucasus (V)	0		0	0	N.A. d/	N.A. d/	N.A. d/	N.A. d/	N.A. d/	N.A. d/	N.A. d/
Volga (VI)	0		0	0	0	0	0	0	0	0	0
Central (VII)	1,160	3.9	500	2.5	1,090	2.5	1,280	1,480	1,670	1,860	2,060
Urals (VIII)	8,050	27.0	11,800	59.0	15,830	36.4	18,640	21,480	24,280	27,120	29,920
East Siberia (IX)	e/	e/	1,340	6.7	2,830	6.5	3,000 f/	3,000 f/	3,000 f/	3,000 f/	3,000 f/
Kazakhstan and Central Asia (X), West Siberia (XI), Far East (XII)	500 e/	1.7 e/	N.A.		1,130 d/	2.6 d/	1,660 d/ g/	2,360 d/ g/	3,070 d/ g/	3,780 d/ g/	4,480 d/ g/
Total	29,800		20,000		43,500		51,200	59,000	66,700	74,500	82,200

a. Iron content unknown.
b. Iron content 50 percent.
c. Regional production estimates for 1951-55, except where otherwise indicated, are extrapolations of the 1950 regional percentages.
d. Production estimates for Transcaucasus, 1950-55, included with totals for Kazakhstan and Central Asia, East Siberia, and the Far East.
e. Production estimates for West Siberia, 1940, included with total for Kazakhstan and Central Asia, East Siberia, and the Far East.
f. Figures adjusted to conform with apparent consumption in region.
g. Figures adjusted to reveal anticipated expansion in other regions, particularly the Transcaucasus.

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largest iron ore producing area in the USSR and undoubtedly will remain so for many years. Of the 43.5 million tons of iron ore (iron content 50 percent) produced in the USSR in 1950, Krivoy Rog mines accounted for about 47.5 percent of the total. 21/ After World War II 34 mines were restored and modernized, and strenuous efforts were made to incorporate full-scale mechanization into development and mining operations. 22/ With the expansion of ore extraction during the Fourth and Fifth Five Year Plans the particle size of the iron ore mined at Krivoy Rog has decreased considerably. The percent of ore in the form of fines averages about 50 percent of the total ore mined. 23/ Occurrence of such excessive fines has resulted in the construction of at least one large plant in the Krivoy Rog area for the purpose of agglomerating the ore. 24/ Since the particle size and chemical composition of the ore varies widely from mine to mine, it has been extremely difficult to supply a product of constant physical quality to the metallurgical centers of the Ukraine and to the Satellite countries, which also are dependent on Krivoy Rog iron ore.* Because of their varying qualities, Krivoy Rog ores are classified in 23 to 25 different categories for shipping. These ores pass through a sorting station at Verkhovtsevo, which serves as a sorting and distribution point for 80 percent of the Krivoy Rog ore output. 25/ That this system of distribution is still a great problem to the metallurgical industry the Ukraine is confirmed by complaints registered by various consuming plants and by certain Satellite countries as recently as 1953. 26/

The increasing amount of fines and the increasing depth of the layers containing the higher-grade iron ore have forced the Russians to turn their attention in recent years to the exploitation of the poorer iron ores in the Krivoy Rog Basin -- that is -- those containing less than 48 percent iron, which exist in great quantities near or at the surface of the ground. The large deposits of iron quartzites which are located at the surface in many places are now being exploited extensively. 27/ Such practice indicates that Soviet geological exploration parties met with failure in their efforts to uncover new iron ore deposits of high grade and large quantity in the region.

The iron ore deposits at Kerch' are said to be more economical to exploit than any other iron ore deposits in the USSR. This fact is

* The metallurgical plants in the southern Ukraine which are the principal consumers of Krivoy Rog ore are located at Dnepropetrovsk, Krivoy Rog, Zaporozh'ye, Dneprodzerzhinsk, Konstantinovka, Kramatorsk, Makeyevka, Stalino, Yenakiyevo, and Zhdanov.

one of the compelling forces behind Soviet efforts to expand production in this district. In spite of their favorable characteristics (geological occurrence, geographic location, and so on), the complex chemical composition of the Kerch' ores has for years retarded a more extensive development of production. Iron ore production in the Kerch' district in 1950 was about 2 million tons, 28/ but plans call for an ultimate capacity of at least 10 million tons per year. 29/ The principal consumer of Kerch' iron ore has been the Azovstal plant at Zhdanov, where vanadium is also extracted from the ore. 30/ Recent information indicates that East Germany and Poland are now receiving ore from Kerch'. 31/

The iron ore industry of the Ural Mountains (Region VIII), which in 1950 accounted for 36.4 percent of the iron ore mined in the USSR, is more diversified and in some respects more complex than is the iron ore industry of the Krivoy Rog Basin. 32/ In contrast to the fairly concentrated production of the southern Ukraine, iron ore production in the Ural Mountains is scattered from Ivdel' in the northern Urals to Khalilovo in the south. The largest iron ore-producing areas in the region are at Magnitogorsk, Nizhniy Tagil, Kushva, and Bakal. Magnitogorsk has for years been the principal source of high-quality Urals iron ore. During World War II, when production ceased in the southern Ukraine, it was the largest iron ore producer in the USSR. Near the end of World War II it was discovered by Russian geologists that, contrary to former beliefs, scarcely one-fourth of the remaining ores at Magnitogorsk were of first quality. 33/ The remaining three-fourths had an increasing amount of impurities and a decreasing iron content, necessitating the use of costly and complex ore-processing equipment. The Soviet press has stated that the high-grade ores at Magnitogorsk may not last for more than 15 years. 34/ This revelation stimulated a large-scale search for additional sources of iron ore to supply the furnaces at Magnitogorsk; however, it now appears that increased utilization of the lower-grade deposits by means of extensive beneficiation is the most rational solution to the problem yet found. In addition, there has been a concentrated effort to free the iron ore mining industry at Magnitogorsk from its task of supplying ore to other Urals metallurgical centers and to the metallurgical center of Stalinsk some 1200 miles to the east, by developing alternate sources of supply for these centers. Thus far, however, this effort has met with only partial success.

A unique aspect of the iron ore industry in the Urals Region is the polymetallic nature of the iron ore mined. For example, the

ore extracted at Mt. Vysokaya near Nizhniy Tagil contains, in addition to 50 to 55 percent iron, enough chalcopyrite to permit the extraction of copper as a byproduct. 35/ It is not known, however, whether or not this is yet being done. The Mt. Blagodat' mine east of Kushva produces at least 1.5 million tons of iron ore annually, which is also processed to yield a byproduct containing titanium. 36/ The ore mined from the Bulandikha mine, largest in the Bakal district, contains 40 to 45 percent iron (which is enriched to a concentrate containing 54 percent iron) and enough manganese to make it useful in the manufacture of ferroalloys. 37/ It should be mentioned here also that the ores mined in the Bakal district, due to their chemical purity, are of such value that they are considered to be the best iron ores in the Urals. On occasions in the past these ores have been shipped as far north as the Serov Metallurgical Works. 38/

Nearly all of the iron ore mined in the Urals Region must undergo beneficiation in one form or another. This has been the case since World War II, and it is certain to become an increasingly important phase of ore-mining operations in future years. The widespread transition of the older Urals iron mines from open-pit to underground operations in an effort to maintain high-grade ore production has been partially successful. With requirements for iron ore increasing yearly, however, it also has been necessary to resort to the exploitation of poorer ores which are near or at the surface. Furthermore, the geological occurrence of many of the ores obtained from underground mines is such that it is impossible to extract them without contamination, thereby necessitating ore-dressing for these ores as well. All of this contributes to the increasing cost per ton of ore mined, a characteristic that is true for the whole of the USSR as well as the Urals Region.

Iron ore production in the West Siberian Region is concentrated in the Gornaya Shoriya district south of Stalinsk. Production in 1950 is estimated at 2.8 million tons, all of which went to the metallurgical center of Stalinsk. 39/ The Tashtagol mine, largest in the region, has an estimated annual capacity (believed to include outputs of the Sheregesh and Shalym mines) of about 2 million tons, making it the principal iron ore source of the Kuznetsk Metallurgical Combine at Stalinsk. 40/ The ore, containing an average of 50 percent iron, is the only iron ore produced in the Gornaya Shoriya district which does not require beneficiation. Other producing mines in the district are the Temir-tau mine and the Odra-bash mine. In the effort to free Magnitogorsk from its task of supplying iron ore

to Stalinsk, the Abakan deposit east of Stalinsk is now undergoing development work, but actual mining operations are awaiting the completion of a rail line to the deposit.

Iron mining in the Central Region of the USSR, while accounting for only 2.5 percent or an estimated 1.1 million tons of the total iron ore production of the country in 1950, is important because of its geographic location. 41/ Mining centers around three towns, Tula, Lipetsk, and Kursk. Of these three areas the Kursk district is most important, since it offers great potentialities for future development and expansion. Known as the Kursk Magnetic Anomaly, the tremendous reserves of low-grade iron quartzites present in the area have long attracted Soviet interest, but progress towards exploitation of the ores has been slow. Only minor quantities of ore were extracted prior to the German invasion, and these were utilized mainly for experimental purposes. In 1945, with the Russians once again in possession of the area, a special trust, KMAstroy, was charged with the task of development and exploitation of the Kursk Magnetic Anomaly. 42/ Increasingly greater budget appropriations were allocated to the project by the Soviet government, and plans called for the development of a mine with an initial annual production capacity of 500,000 tons of iron quartzites. 43/ More recent data are lacking, but in view of progress made in the exploitation of iron quartzites in the Krivoy Rog Basin, large-scale production of deposits in the Kursk district appears likely in the near future.

The combined production of the mines around Tula and Lipetsk is believed to be about 1 million tons annually. 44/ These mines have been in operation for a number of years and, in view of the declining quality and quantity of the reserves, it is anticipated that production may decrease. The ores, not being of particularly good quality, require concentration and are consumed locally by furnaces at Tula and Lipetsk and Kosaya Gora. 45/

Mining at the Dashkesan deposits in the Transcaucasus started in 1948. 46/ Plans called for the mining of 2 million tons of iron ore annually, which was to be shipped to metallurgical plants at Rustavi and Sumgait. 47/ These mines, one open-pit and one underground installation, are now believed to be operating at near capacity.

As far as is presently known, iron mining is conducted only on a very limited scale in the North and Northwest, in Kazakhstan

and Central Asia, in East Siberia, and in the Far East and not at all in the West, the Southeast, and the Volga Regions. A few iron ore mines are believed to be in operation in Kazakhstan, but available information is so fragmentary that no valid conclusions can be drawn regarding production trends in that region. The Balyaginskiy mine, 25 kilometers northwest of Petrovsk, is the only iron mine in the East Siberia Region known to be in operation in recent years. 48/ The mine supplies a small quantity of low-grade iron ore to the metallurgical plant at Petrovsk, to which it is connected by rail spur. In the Far East Region, the development of iron ore deposits in the Maly Khingan district has been reported. 49/ Plans call for these deposits to be the principal iron ore supply source for the Amurstal Steel Plant at Komsomol'sk, which now receives small quantities of iron ore from the Nikolayevsk mining installations. 50/

D. Trade.

The USSR, being self-sufficient in iron ore, requires no imports of this raw material. There is a possibility that small quantities of ore may be moving from iron-rich northeast China to the iron-deficient Soviet Far East coast either by ocean transport or by rail, but conclusive evidence of shipments between these two areas is lacking.

In the past the USSR intermittently imported high-grade iron ore from Sweden. This practice has been halted since World War II; the European Satellites, however, are still importing Swedish ore.

The estimated production, consumption, and surplus available for export of iron ore in the USSR, 1950-55, are shown in Table 6.* Available data in this table on exports for 1950 through 1953 were obtained by totaling the estimated imports of iron ore into the various Satellite countries from the USSR during those years. These figures closely approximate the total Satellite requirements for iron ore above domestic production and imports from other sources. Estimates of iron ore exports for the years 1954 and 1955 cannot be made because of insufficient data.

As far as is known, there are no exports of Soviet iron ore to countries outside the Soviet Bloc. Czechoslovakia, Poland, and East Germany are the principal recipients of iron ore exports from the USSR.

* Table 6 follows on p. 18.

Table 6

Estimated Production, Consumption, and Surplus Available for Export of Iron Ore in the USSR a/
1950-55

Year	Production (Million Metric Tons)	Consumption (Million Metric Tons)	Percent of Self-Sufficiency	Surplus Available for Export (Million Metric Tons)	Percent of Surplus Available for Export
1950	43.5	41.3	105.3	2.2	5.1
1951	51.2	47.1	108.7	4.1	8.0
1952	59.0	53.4	110.5	5.6	9.5
1953	66.7	59.8	111.5	6.9	10.3
1954	74.5	66.1	112.7	8.4	11.3
1955	82.2	72.4	113.5	9.8	11.9

a. Iron content 50 percent.

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E. Consumption.

Figures in Table 6 on estimated iron ore consumption in the USSR for the years 1950 through 1953 are based on the announced iron and steel production for those years, allowing 2 tons of iron ore (iron content 50 percent) for each ton of pig iron produced and 0.1 ton of iron ore (iron content 50 percent) for each ton of steel produced. Estimated iron ore requirements for the years 1954 and 1955 are based on predicted iron and steel production for each of these years, using the same method as above.

There is no published information about inventories and stockpiling of iron ore in the USSR. It is believed that no sizable inventories of iron ore are maintained either at the mines or in reserve at blast furnaces. During recent years, iron and steel producing facilities in the USSR have been expanding at a rapid rate, and indications are that iron ore is utilized as quickly as it becomes available. It is therefore unlikely that there is any strategic stockpiling of iron ore at present. There is no indication of surplus production above the domestic and export requirements of the USSR.

F. Expansibility.

The prospects for substantially increasing iron ore production in the USSR by 1955 are good. Soviet iron ore reserves are not a limiting factor insofar as quantity is concerned; however, their quality and distribution have an important influence on the locational as well as the economic pattern of the iron and steel industry. The principal producing areas will continue to be in the southern Ukraine and the Urals, but the Central (VII), West Siberia (IX), Kazakhstan (X), and Central Asia (X), and East Siberia (XI) Regions are destined to assume added importance. The extensive deposits near Kursk should start large-scale production by 1955. The open-pit operations at Kerch' are also being expanded rapidly. Several iron ore deposits in the West Siberia (IX), Kazakhstan and Central Asia (X), and East Siberia (XI) Regions which are remote from existing transportation lines can be put into production soon after the completion of new railroad lines now being built.

Simultaneously with the struggle of the Soviet iron mining industry to increase production at the rate necessary to meet rising domestic requirements and export commitments, two distinct trends are developing. One is the trend from open-pit to underground mining

operations at most of the richer iron ore deposits, especially those around Krivoy Rog. The necessity of going deeper into the earth for the high-grade ores requires greater labor, material, and power inputs to maintain production. The result is a sharply rising cost per ton of ore mined. The other, more significant, development in the iron mining industry of the USSR is the increased utilization of low-grade iron ores. Such practice has been brought about not only by the rapid depletion of the rich ore reserves in some parts of the country (notably Magnitogorsk, in the Ural Mountains) but also by the policy of developing local iron ore bases to support existing and planned regional iron and steel centers throughout the USSR in order to alleviate transportation problems. The large initial capital outlays required for ore beneficiation plants, in addition to the necessary handling and processing of greater tonnages of ore and overburden in the exploitation of low-grade ores, result in a higher cost per ton of processed ore.*

Planned expansion of iron mining in the USSR faces two potentially limiting problems. The planned development and expansion of production at several iron ore deposits depends on the solution of numerous complex technological problems, requiring much original research yet to be accomplished in the field of extractive metallurgy. Also, inefficiency of labor and management has been, and still is, a considerable problem to the Soviet iron mining industry. This problem may be aggravated by the additional skilled manpower requirements of the expanding iron ore beneficiation program. Failure to solve either or both of these problems satisfactorily could result in a delay of planned expansion in the Soviet iron and steel industry, and would have an even greater effect on the expansion plans of the Satellite iron and steel industries, which are becoming increasingly dependent on Soviet iron ore. In view of the substantial though diminishing reserves available for current exploitation, however, the Russians can borrow time for the solution of their technological and investment problems by exhausting these supplies at a more rapid rate. It is therefore not believed that the development of the iron and steel industry will be handicapped by a lack of iron ore in the near future.

* The iron and steel industry of the US, also confronted with the exhaustion of domestic high-grade iron ores, has -- in addition to developing domestic low-grade deposits -- resorted to the development of sources of high-grade ores outside the US, primarily in Canada and Venezuela.

II. Satellites.

A. Introduction.

The European Satellites make only a minor contribution to the total iron ore supply of the Soviet Bloc. The ore reserves of the European Satellites, while sufficient for limited expansion, constitute only about 6 percent of the total Soviet Bloc supply. For the most part the European Satellite ores are of low grade, and the reserves are widely dispersed, thus prohibiting large-scale exploitation.

Poland, East Germany, and Czechoslovakia, the three most important areas in terms of iron ore reserves and production, never have been self-sufficient. In the past they were forced to rely on imports, largely from Sweden, to augment domestic production and to enrich domestically mined ores to provide a suitable blast furnace charge.

Under Soviet direction iron and steel production, and consequently iron ore production, has been expanding in line with government planning. Despite significant gains, ore production has not fulfilled Soviet expectations. The USSR, in order to promote the increasing industrial activity in the European Satellites, has found it necessary to supply increasing tonnages of ore. Soviet exports to the European Satellites in 1953 were on the order of 6.8 million tons (iron content 50 percent). In order to make up production deficiencies, certain Satellites -- especially Poland and Czechoslovakia -- find it necessary to import ore not only from the USSR but also from other sources, including Communist China.

The exploitable iron ore reserves of Communist China amount to about 1 billion tons. While of current importance only in support of the domestic iron and steel industry and for limited exports, the reserves constitute the greatest supply of iron ore in the Soviet Bloc outside the borders of the USSR. Communist China is capable of meeting the demands of its own foreseeable industrial expansion and is in an excellent position to supply the ore import requirements of Japan, if Japanese import restrictions are eliminated.

The sections which follow on each of the Satellites present information on iron ore reserves, on production, and on trade, and give attention to the future prospects of the iron ore mining industries.

B. Communist China.

1. Reserves.

The probable iron ore reserves of Communist China have been estimated by many different investigators at between 1.5 and 5.5 billion tons. Allowing for the large discoveries in Manchuria reported by the Japanese, the latter figure is believed to be more correct. It is estimated, however, that only 1 billion tons are exploitable in the near future. 51/ Of the total of 5.5 billion tons, 4.7 billion are credited to Manchuria, of which over 95 percent is low-grade ore of 20 to 40 percent iron content. 52/

A more accurate picture of the iron ore potentialities of Communist China results from a survey of the proved reserves. Nearly 640 million tons of high-grade (direct smelting) ore exist in the country. Roughly, this ore is geographically distributed as follows: Manchuria, 35 percent; north China, 35 percent; southeast coastal region, 12 percent; Yangtze valley region, 10 percent; and southeast region, 8 percent. 53/

Much of the high-grade Manchurian iron ore is found in conjunction with low-grade ore, and a substantial production was not achieved until beneficiation plants were constructed to concentrate the low-grade ore. During the peak production year, 1943, a little over half of the ore mined was of low grade. 54/ Between World War II and the overthrow of the Nationalist government, the USSR completely removed the essential ore concentrating facilities from Manchuria. The annual capacity of the concentration equipment removed was estimated at 900,000 tons. 55/ Thus when the iron and steel industry of Manchuria resumed operations in 1949 under Chinese Communist control, it was necessary to use high-grade ore which could be charged directly into the blast furnaces without beneficiation. The extent to which these ores are being utilized at present is unknown. Since it is vital to the future of the industry that the rich ore supply not be depleted, it is likely that beneficiation plants will be reestablished. The lean ores could then supply approximately one-half of the iron ore needed by the Manchurian metallurgical industry.

The most important high-grade ore reserve in north China is the Lung-yen field of Chahar Province. Its wartime peak production of about 1.5 million tons in 1944 was second only to the production in the vicinity of An-shan, Manchuria. 56/ The An-shan

reserves, which are in excess of 200 million tons, can be mined largely by open-cut methods and constitute an important potential. Much of the remaining high-grade ore in North China is inaccessible, as in Suiyuan Province, or too costly to mine, as in the scattered deposits in Shansi Province, to permit economic development on a large scale without a very large investment in transportation facilities.

The reserves of the coastal area of southeast China, apart from the Hainan ores which represent a total of 100 million tons, are of little significance because of their scattered distribution. The Hainan deposits rank second in importance to the Lung-yen deposits as a source of high-grade ores, and because of their favorable geographic position they are of first importance as a source of export supply. The deposits of Hupeh and Anhwei Provinces are the only important occurrences in the Yangtze valley region, but in order to smelt the ore locally it is necessary to import coking coal from north China. The Chinese Communists have made expansive claims about the establishment of a great iron and steel complex in Hupeh Province based on discoveries of additional ore in the important Ta-yeh mining area. Although Ta-yeh ranks as the best iron deposit in central China, extensive investigations before Communist control indicate that it could not support a large iron and steel industry unless the iron ores of the surrounding area as well as the ore from Hainan were employed. No definite steps are known to have been undertaken toward establishment of such a complex.

The high-grade iron ore resources of the southwest region are of little strategic importance. Although the rich ore reserves of the four principal mines in Szechwan and Yunnan provinces total about 18 million tons, the deposits are scattered, small, and of significance only to the local iron industry.

Of the 640 million tons of proved reserves of high-grade ore in Communist China, it is estimated that only 500 million tons are available for early exploitation.

2. Production.

During recent years the abnormal political and economic pressures brought to bear, first by the Japanese conquest and occupation and later by civil conflict between Nationalist and Communist forces, have completely upset all normal activities in iron ore production and consumption in Communist China. Under the Japanese, the

production of iron ore in China proper (excluding Manchuria) reached 5,460,500 tons in 1943, almost trebling the 1935 production of 1,960,200 tons. 57/

In Manchuria during 1943 a peak production of 5.1 million tons of iron ore was achieved as compared with only 1,130,000 tons in 1934. In evaluating the 1943 output it must be pointed out that about half of the production was of low-grade ores, so that the 5.1 million tons produced were equal to only about 3.5 million tons if compared with the 50- to 60-percent iron content ores mined in China proper. 58/

Post-World War II iron ore production, under the Nationalist government, was reduced to a small fraction of its wartime rate. After the Communist regime came into power, iron ore mining rapidly returned to normal in relation to the domestic market, but export channels to Japan were not reestablished. In the absence of a resumption of the previous role of China as a supplier of the Japanese metallurgical industry, the production of iron ore in Communist China will continue to remain in reasonable balance with the requirements of its iron and steel industry, plus provision for a rather minor trade with the European Satellites. On this assumption, but without allowance for exports to Japan, the estimated production and requirements of iron ore in China during 1935-55 are shown in Table 7.*

3. Trade.

Since Communist China commands adequate supplies of iron ore to meet its relatively low present needs, it may be presumed that no imports will be required.

All of the iron ore exports of China proper went to Japan from 1938 through 1944, and the maximum net export of iron ore from China proper was 3,876,000 tons in 1942. Of the 5,460,500 tons of ore produced in China proper in 1943, 3,300,000 tons were exported to Japan and Taiwan, while over 600,000 tons went to Manchuria; and an amount of pig iron equal to 400,000 tons of iron ore was sent to Japan. 59/

* Table 7 follows on p. 25.

Table 7

Estimated Production and Requirements of Iron Ore in China a/
1935-55

Thousand Metric Tons

Year	Production b/	Requirements c/
1935	3,135	1,616
1936	3,359	1,676
1937	3,216	1,971
1938	3,189	2,829
1939	4,620	4,029
1940	5,219	4,554
1941	8,222	N.A.
1942	9,727	N.A.
1943	10,561	5,805
1944	8,846	76
1945	4,178	15
1946	15	N.A.
1947	19	18
1948	247	N.A.
1949	868 d/	504 f/
1950	2,082 e/	1,982 f/
1951	3,159 e/	3,009 f/
1952	4,054 e/	3,854 f/
1953	4,846 e/	4,596 f/
1954	6,577 e/	6,277 f/
1955	7,502 e/	7,152 f/

a. Iron content of ore produced before 1950 is unknown; iron content of ore produced in 1950-55, 50 percent.
b. For 1935-48, see 60/.
c. Estimated for 1935-48.
d. Estimate based on requirements plus known exports.
e. Estimated based on requirements plus an allowance for exports. Export allowance for 1950, 100,000 tons; 50,000-ton increments for each of the years thereafter.

Table 7

Estimated Production and Requirements of Iron Ore in China a/ 1935-55 (Continued)

f. Calculated on the basis of iron ore of 50 percent iron content for pig iron production, plus 10 percent of the steel production charged to furnaces as ore of 50 percent iron content. Pig iron and steel production figures announced for 1949 and 1954. Pig iron and steel production estimates for 1950-53 based on announced production increases given as percentage of 1949 production. Production for 1955 estimated by extrapolation.

The largest known postwar exports were 364,000 tons in 1949. 61/ The development of the iron ore export market of Communist China is retarded by the import restrictions of its principal customer, Japan. For the present, all exports of Chinese iron ore are sent to the Soviet Bloc.

The reported exports of iron ore from Communist China by ship during 1951-53 are shown in Table 8.* The information in this table is not intended to give a summary of total iron ore exports but is a summary of reported exports from Hainan and North China.

The iron ores of Communist China are capable of being competitive in the Japanese market because of their large extent, proximity, and high quality. If trade were resumed with Japan, an exportable surplus of 3 million tons of ore could easily be produced. The pressures of 1943 yielded a surplus of nearly 4 million tons. There is a possibility that the Communist regime may wish to conserve the rich iron ore resources rather than export them; however, China needs finished products, especially capital equipment, which is obtainable from Japan and the European Satellites in exchange for iron ore.

* Table 8 follows on p. 27.

Table 8

Reported Exports of Iron Ore by Ship from Communist China a/
1951-53

Metric Tons

Country	1951	1952	1953
Poland	N.A.	54,612 62/	86,975 b/ 64/
Rumania	8,534 65/	9,495 66/	8,000
Czechoslovakia	N.A.	8,000 67/	N.A.
USSR	N.A.	11,421 68/	N.A.
Bulgaria	14,015 69/	N.A.	16,500 70/
Total	22,549	83,528	111,475

a. Based on incomplete data.
b. Reported exports out of trade agreement quota of 100,000 tons. 63/

It appears doubtful that the USSR could economically import from Communist China more than a few thousand tons of ore for its Komsomol'sk plant. If this plant were expanded to include blast furnace facilities, however, it would constitute a significant potential export market.

4. Expansibility.

Manchuria is the largest potential iron and steel producing area in all Communist China. In addition to substantial local reserves of high-grade ore, there exists within feasible transportation distance much low-grade ore which could be made suitable for smelting through the extensive use of beneficiation practices.

The iron ores of China proper, including Hainan, are generally of good quality and may be smelted without beneficiation. Many of the major deposits occur near the surface and are suitable for open-cut mining, by hand if necessary. In relation to the size of the country, Chinese reserves of iron ore are limited and widely dispersed. A large integrated iron and steel industry, however, could be supported on the ores of central China, augmented by supplies from Hainan.

The rich iron ore reserves in north China which are presently exploitable are generally scattered and supply local smelters. These ores are of importance as potential sources of supply both for Manchurian industry and for export.

The known high-grade iron ores of southwest China are limited in quantity and, aside from possibly supplying an increase in iron ore for the local steel industry, they are insignificant.

With reserves of exploitable ore amounting to approximately 1 billion tons and additional reserves exploitable at higher cost, iron ore production in Communist China can be increased to meet all needs which can be foreseen at present.

C. Czechoslovakia.

1. Reserves.

The iron ore reserves of Czechoslovakia are the largest in the European Satellites, although they are generally of low grade. Some high-grade ores suitable for direct smelting exist, but the average grade of the mined ore is about 33 percent iron, and the bulk of the output requires beneficiation to provide a satisfactory blast furnace feed. 71/

The principal iron ore deposits in Czechoslovakia are situated in the eastern part of Slovakia, and in Bohemia southwest of Prague at the opposite end of the country. Central Czechoslovakia -- that is, Moravia -- produces some iron ore, but in relation to the total national output it is of minor importance. Although the reserves of Slovakia are less extensive than those of Bohemia, Slovakia is known to have higher production because its ores are relatively low in silica and phosphorus and are less costly to beneficiate. 72/ The estimated reserves of iron ore in Czechoslovakia in 1947 are shown in Table 9.* Appendix B contains additional pertinent information about the iron ores of each of the regions, and the names and locations of deposits and mines.

2. Production.

Iron ore production in Czechoslovakia in 1937 totaled 1,836,000 tons. In the following year, under German occupation,

* Table 9 follows on p. 29.

Table 9

Estimated Reserves of Iron Ore in Czechoslovakia 73/
1947

	Million Metric Tons		
Region	Probable	Proved	Percent Iron Content
Slovakia	N.A.	30	32 to 38
Bohemia	309	30	32 to 35

production declined to 1,319,000 tons. Because of the intensified efforts of the Germans to expand ore production and the opening of new mining sites, Bohemia and Moravia were able to increase production of iron ore during the early years of the occupation. Total Czechoslovak production in 1939 increased to 1,432,000 tons, and by 1943 it reached a peak of 1,944,000 tons. In 1945 the total production of ore fell to only 271,000 tons. By the end of 1946, iron ore mining had again been accelerated, and the total production for the year was 1,123,000 tons. 74/

Since early in World War II, iron ore production in the provinces of Bohemia and Moravia has steadily declined, and there is little indication that this trend will be reversed in the immediate future. Although recent production data for Slovakia are not available, production in this province in contrast, has shown a considerable increase and at present may account for as much as 75 percent of the total domestic supply. 75/

The iron ore production targets of the Czechoslovak Five Year Plan (1949-53) and the estimated production for the period are shown in Table 10.*

In 1946 there were reportedly 26 iron mines in operation in Czechoslovakia. 76/ Under Communist direction there has been an intensified utilization of domestic raw material sources. Some of the old mines in Bohemia and Slovakia which had been shut down for some time were to have been reactivated, and 17 ore dressing plants were to have been constructed by 1953. In addition, four new mines supposedly have been opened. 77/

* Table 10 follows on p. 30.

Table 10

Planned Production and Estimated Production of Iron Ore in Czechoslovakia a/ 1949-55

Thousand Metric Tons

Year	Planned Production	Estimated Production
1949	N.A.	1,475 b/
1950	N.A.	1,600 b/
1951	1,630 c/ 78/	1,700 b/
1952	2,840 c/ 79/	2,000 80/
1953	3,780 c/ 81/	2,300 b/
1954	d/	2,600 b/
1955	d/	2,900 b/

a. For methodology, see Appendix C.
b. Estimated.
c. Five Year Plan.
d. It was announced that Czechoslovakia has abandoned its Five Year Plans; henceforth there will be only annual plans. 82/

In view of the production of only 2 million tons of iron ore in 1952, accomplishment of the 1953 Plan target of 3,780,000 tons is unlikely. Such an expansion would mean an 89-percent production increase which, in view of reported production difficulties, shortages, and labor unrest, appears to be unattainable.

An incentive for increased domestic ore production in Czechoslovakia has resulted from the difficulties encountered in the utilization of the iron ore from Krivoy Rog in the USSR. Although Krivoy Rog is known to have large quantities of first-class iron ore with very low percentages of sulfur and phosphorus and with good physical characteristics for smelting, Soviet authorities have been shipping to Czechoslovakia ore at least one-half of which was composed of Russian fines and fines left from the German exploitation of Krivoy Rog. 83/ The poor physical condition of this ore necessitated sintering it in the Czechoslovak plants to agglomerate the material for the blast furnaces, and mixing it with high-grade Swedish ores to improve smelting efficiency. 84/

3. Trade.

In 1949, Czechoslovakia depended on foreign sources for about 60 percent of its iron ore requirements. 85/ Unless domestic production is increased more rapidly than in recent years, the iron ore imports needed in 1955 will amount to about 68 percent of the anticipated domestic consumption. At present the USSR and Sweden furnish the bulk of the ore used in Czechoslovakia: other countries supply only limited quantities.

In 1950 and 1951, Czechoslovakia imported, respectively, 60,000 and 65,500 tons of iron ore from India. 86/ During the summer of 1952, Metalimex, the Czechoslovak trading firm, showed greatly increased interest in buying Indian ore. Czechoslovak offers of $10.50 per ton for Indian ore were said to have been in excess of Japanese offers and considerably above the prevailing rate for 58 to 60 percent ore. 87/ The reported imports from India in 1952 amounted to 71,450 tons. As a result of increased demands, imports of Indian ore rose to 113,597 tons in 1953. 88/

Until 1950, Sweden was the chief external source of iron ore for Czechoslovakia. Imports of Swedish ore averaging 62-percent iron content reached approximately 1.2 million tons in 1948. In 1949 and 1950, imports were, respectively, 885,000 tons and 920,000 tons, a reduction resulting from an unfavorable trade balance. 89/

Under the 1951-52 Czech-Swedish Trade Treaty, which covered the period from 1 March 1951 to 1 March 1952, Czechoslovakia was guaranteed a total of 720,000 tons of iron ore. During 1952-53 treaty negotiations, Czechoslovakia requested at least 1 million tons of ore. Sweden, however, did not agree to deliver more than 450,000 tons. 90/ According to incomplete reports, actual deliveries for the period from January through June 1952 amounted to only 172,000 tons. As a result of the facts that Czechoslovakia exceeded the permissable credit limit under the 1952-53 trade agreement and failed to maintain export commitments, all exports of iron ore from Sweden to Czechoslovakia temporarily ceased on 2 October 1952. 91/ In early 1953 a delegation of Metalimex representatives visited Stockholm to discuss the 1953-54 commercial treaty. Scheduled deliveries of Swedish iron ore for Czechoslovakia were to be reduced in this treaty to 400,000 tons. 92/

In June 1953, Czechoslovakia made a firm offer to Brazil to purchase 100,000 tons of iron ore. 93/ As in the case of iron ore

exports to Poland, the Brazilians were advised of the US position under the Battle Act. In October 1953 it was reported by the Brazilian press that an export license had been granted for the export to Czechoslovakia of 60,000 tons of iron ore at $17.50 per ton. Two months later a Brazilian mining firm was about to ship 10,160 tons of iron ore to Metalimex, in Prague. 94/

The reported imports of iron ore into Czechoslovakia, by country, during 1950-53, are shown in Table 11.* From this record it is apparent that Czechoslovakia has been attempting to obtain ore from every possible source, and presumably this trend will continue. Its extent, however, will depend on the willingness of the USSR to make up a greater part of the Czechoslovak ore deficit and on the ability of Czechoslovakia to increase her self-sufficiency.

If iron ore shipments from the West should be curtailed and if Soviet iron mining expansion continues, it is highly probable that by 1955 the USSR will be able to supply the bulk of the Czechoslovak import demand of 4 million tons.

Regarding exports, the registry of incoming iron ore shipments received at the Stalin Metallurgical Combine at Fuerstenberg on the Oder, East Germany, indicated that some iron ore was received from Czechoslovakia during 1952. 95/ The total volume of these shipments is unknown, but it is believed to have been small. No other information is available on Czechoslovak iron ore exports in recent years.

4. Consumption.

The estimated production, consumption, and import requirements of iron ore in Czechoslovakia during 1947-55 are shown in Table 12.** The position of Czechoslovakia as an importer of iron ore requires the maintenance of working inventories to offset interruptions to the supply from foreign sources. There is, however, no direct evidence of the extent of these inventories, or of the existence of a strategic reserve.***

* Table 11 follows on p. 33.
** Table 12 follows on p. 34.
*** Continued on p. 35.

Table 11

Reported Imports of Iron Ore into Czechoslovakia, by Country
1950-53

Thousand Metric Tons

Country	1950	1951	1952	1953
Norway	15,912 96/	20,000 97/	20,178 98/	39,689 a/ 99/
Sweden	920,000 b/ 100/	750,000 101/	450,000 c/ 102/	400,000 103/
West Germany	40 104/	62,310 105/	5,693 106/	N.A.
India	60,000 107/	65,500 108/	71,450 109/	113,597 110/
Bulgaria	N.A.	5,389 111/	N.A.	N.A.
Rumania	N.A.	5,816 112/	N.A.	N.A.
China	N.A.	N.A.	8,000 113/	N.A.
USSR	1,300,000 114/	720,000 d/ 115/	2,100,000 116/	2,300,000 e/ 117/
Austria	N.A.	N.A.	691 118/	
Union of South Africa	N.A.	N.A.	N.A.	6,000 119/
Brazil				10,160 120/
Total	2,295,952	1,629,015	2,656,012	2,869,446

a. During January to July.
b. During 1 February 1950 to 31 January 1951.
c. Assuming that Sweden shipped the quota given under the 1952-53 trade treaty.
d. During March 1951 to March 1952. Believed to be incomplete.
e. Assuming that planned shipments through Cierna nad Tisou (Czechoslovakia) were accomplished.

Table 12

Estimated Production, Consumption, and Import Requirements of Iron Ore in Czechoslovakia a/ 1947-55

Year	Production (Thousand Metric Tons)	Consumption b/ (Thousand Metric Tons)	Percent of Self-Sufficiency	Import Requirements c/ (Thousand Metric Tons)
1947	910 d/	3,094	29	2,184
1948	940 d/	3,595	26	2,655
1949	974 d/	3,685	26	2,711
1950	1,056 d/	4,063	26	3,007
1951	1,122 d/	4,185	27	3,063
1952	1,320 121/	4,510	29	3,190
1953	1,518 d/	4,920	31	3,402
1954	1,616 d/	5,330	30	3,714
1955	1,914 d/	5,960	32	4,046

a. Iron content 50 percent.
b. Based on CIA pig iron and steel production estimates. Calculated on the basis of iron ore of 50 percent iron content for pig iron production, plus an allowance equal to 10 percent of the steel production, charged to steel-making furnaces as ore of 50 percent iron content.
c. It is assumed that apparent import requirements were satisfied.
d. Estimated.

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5. Expansibility.

Czechoslovakia is reported to contain substantial quantities of iron ore reserves, principally in Bohemia, and as mining properties are considered, there is nothing from the standpoint of supply to prevent long-term expansion. Bohemian ore is of relatively low grade and is costly to beneficiate; however, the actual and estimated ore reserves amount to 339 million tons, or approximately 110 million tons of iron.

The Slovak iron ore deposits are not as extensive as those of Bohemia, but they are of more favorable chemical composition. The estimated reserves amount to 30 million tons, which in terms of iron content represent about 10.5 million tons.

Based on the estimated current extraction rate of 2.3 million tons per year, the Czechoslovak iron ore supply should be sufficient for over 150 years, assuming no undue expansion of the iron and steel industry. Extreme pressures are being placed upon the industry in order to achieve the present production. Shortages of equipment and labor unrest appear to present continuing difficulties to Soviet direction. It is unlikely that in 1955 production will reach more than 2.9 million tons.

D. Poland.

1. Reserves.

Polish iron ore resources are of low grade, averaging slightly over 30 percent iron content, are widely scattered, and are limited in extent. The principal iron ore deposits exist between Warsaw and the Czechoslovak frontier in the regions of Czestochowa-Weilun and Kielce-Radom. There are also some small deposits in the Sudetes region and in the northeastern part of the Upper Silesian basin. Bog iron ores exist in several other regions throughout the country. 122/

The most important, the Czestochowa-Weilun region, in 1949 supplied close to 75 percent of the total national ore output. The entire area measures approximately 33 square miles, with the richest deposits located in the vicinity of Czestochowa. Proved and probable ore reserves amount to about 80 million tons. 123/

The ore reserves of the Kielce-Radom region are estimated to be about 137 million tons. Small ore deposits are scattered throughout the area; however, only a few of these are suitable for exploitation because of the nature of occurrence. 124/

The deposits in the Sudetes region of Lower Silesia apparently do not warrant exploitation.

In the past when only charcoal was used for iron smelting, the exploitation of bog iron deposits was popular. This ore was the basic raw material for the numerous small furnaces operating at that time throughout Poland, the principal localities being Poznan, Jarocin, Krotoszyn, and Kalisz. 125/ It is believed that since these ore deposits are not included in current plans for iron ore production, they are of no present metallurgical importance.

The estimated reserves of iron ore in Poland in 1949 are shown in Table 13.

Table 13

Estimated Reserves of Iron Ore in Poland a/ 126/
1949

Thousand Metric Tons

Region	Probable	Proved	Total
Czestochowa-Wielun	54,000	26,000	80,000
Kielce-Radom	106,580	20,480	127,060
Silesia-Krakow	7,500	1,050	8,550
Lower Silesia	800	320	1,120
Total	168,880	47,850	216,730

a. Omitted from the table are estimates of the reserves of the former German territory annexed by Poland in 1945 such as those in the vicinity of Schmiedeberg. Estimates of these ores run from 2 million to 10 million tons.

2. Production.

During 1939, the year of the German invasion, a peak production of 1,053,000 tons was reached, but production in the following year declined to a prewar level of about 800,000 tons. 127/ By 1944, production had dropped to 681,000 tons. 128/ In the spring of 1945 the Germans began their withdrawal and, in addition to flooding most of the mines, conducted a program of methodical destruction which left the industry in a state of almost total collapse. In 1945, production was only 106,000 tons. 129/ The following year marked the beginning of improvements which have since continued. 130/ Production figures in terms of tons of ore are: 1946, 424,000 131/; 1947, 540,000 132/; 1948, 630,000*; and 1949, 700,000. 133/ This production was accomplished entirely within the area of prewar Poland. Although 27 new mines were to have been established after World War II, no identification of these mines is available. 134/

The planned production and estimated production of iron ore in Poland during 1950-55, the period of the Six Year Plan, are shown in Table 14.

Table 14

Planned Production and Estimated Production of Iron Ore in Poland a/
1950-55

Thousand Metric Tons

Year	Six Year Plan Production 135/	Estimated Production
1950	720	790 136/
1951	883	900 137/
1952	1,040	1,027 138/
1953	1,605	1,100 b/
1954	2,180	1,200 b/
1955	3,000	1,300 b/

a. For methodology, see Appendix C.
b. Estimated.

* Estimated.

In order to reach the 1955 ore production target of the Six Year Plan, the industry would have to expand its output nearly 200 percent over the estimated 1952 production. Because of the nature of the iron ore deposits, such an increase in production would require large capital investment and substantial increases in manpower. Under the strains of reported production difficulties and shortages, the ability of Poland to assume such an added burden in the next 2 years appears doubtful, and it is likely that the 1955 production will fall far short of the target.

Polish iron ore mining methods were simple, if not primitive, as of 1940, with mining, hoisting, and hauling done in most cases without benefit of mechanization. Although in a few of the so-called "deep mines" (25 to 70 meters) where ore deposits are thick and rich, some improved techniques, including small mine cars and mechanical hoists, were employed, Polish iron ore mining is in no way comparable to that of the US.

The only ore-dressing practice known to be employed in Poland is the calcination of sideritic ores, whereby the iron content is raised by the removal of carbon dioxide and moisture. The Russians reportedly are introducing new iron ore beneficiation processes to Poland, but no information is available as to their nature or application.

3. Trade.

The iron and steel industry of Poland has historically been geared to a consumption of iron ore far in excess of domestic production, a condition which has been aggravated by the expansion of the iron and steel industry under Communist domination. For many years, Sweden was the principal supplier of iron ore to Poland. Postwar demands for Swedish ore in Western markets have strengthened the trading position of Sweden.

As a result of an impasse in trade negotiations, in which the Swedes vainly tried to secure a further reduction in the price of Polish coal, Swedish iron ore exports to Poland virtually ceased in September 1952. 139/ As coal stocks were adequate at that time, Swedish coal importers were reluctant to agree to a price higher than a level competitive with British coal or oil. As a result, 1953 trade between Poland and Sweden in coal and iron ore was reduced. Although 710,000 tons of coal were scheduled to be imported by Sweden

during the period of 1 March to 31 August under a bilateral coal agreement, the Swedes decided to limit imports during that time to only 480,000 tons. 140/

Under the terms of a trade agreement negotiated in the spring of 1953 and slated to run until 28 February 1954, Poland was to receive 735,000 tons of Swedish iron ore; this was a reduction from the 1 million tons originally discussed. 141/ The resulting ore deficit in Poland has been underwritten largely by the USSR.

As the production of iron ore in Sweden is being increased, changes in the international economic and political situation may again make Poland a welcome market.

As a result of the threatened shortage of iron ores in Poland in 1953 -- largely because of the Swedish situation -- the Polish State Economic Planning Commission is reported to have secretly reduced the 1953 Plan for pig iron production by 100,000 tons; that is, the nonfulfillment of the Plan was to be tolerated to that extent. 142/

It was proposed at the end of 1952 that iron ore imports during 1953 would total 2,975,000 tons, of which 1,900,000 tons were to be received from the USSR. 143/

The following table reveals that in the last 3 years Poland, however, has made vigorous efforts to import iron ore from wherever it was available, and the total of known imports exceeded the 1953 proposal. Although this table contains all the information available, it is probable that gaps exist. The reported imports of iron ore into Poland, by country, during 1950-53, are shown in Table 15.*

On 24 October 1952, Brazil signed a 1-year trade agreement under which was listed 100,000 tons of iron ore to be exported to Poland at $18.50 per ton. 144/ Despite warnings by the US that if the agreement were carried out, assistance by this country could not be continued under the provisions of the Battle Act, and despite agreement by the then Acting Foreign Minister of Brazil that ore would not be shipped, it was subsequently learned that 41,000 tons had been exported. 145/ The director of the chief Brazilian iron ore mining

* Table 15 follows on p. 40.

Table 15

Reported Imports of Iron Ore into Poland, by Country
1950-53

Metric Tons

Country	1950	1951	1952	1953
Sweden	700,000 146/	750,000 147/	966,000 148/	735,000 a/ 149/
USSR	872,447 150/	1,108,000 151/	1,440,000 152/	1,900,000 b/ 153/
India	N.A.	2,282 154/	3,820 155/	29,654 156/
France	N.A.	100,000 157/	20,000 158/	12,000 c/ 159/
Tunisia	N.A.	10,000 161/	25,458 162/	7,200 d/ 163/
Algeria	N.A.	10,000 164/	43,694 165/	11,500 d/ 166/
China	N.A.	N.A.	54,612 167/	86,975 e/ 168/
Brazil	N.A.	N.A.	9,850 169/	41,000 170/
Spanish Morocco	N.A.	8,200 171/	N.A.	N.A.
East Germany	60,000 172/	95,700 173/	N.A.	N.A.
Rumania	N.A.	2,000 174/	N.A.	N.A.
Bulgaria	N.A.	5,620 175/	N.A.	5,000 f/ 176/
Norway	69,085 177/	75,000 178/	150,000 179/	150,000 180/
West Germany	N.A.	5,490 181/	N.A.	N.A.
Austria	N.A.	1,230 182/	N.A.	N.A.
Switzerland	N.A.	19,355 183/	N.A.	N.A.
Italy	N.A.	10,000 184/	N.A.	N.A.
Hong Kong	N.A.	8,382 185/	N.A.	N.A.
Greece	N.A.	N.A.	N.A.	50,000 g/ 186/
Total	1,701,532	2,211,259	2,713,434	3,028,329

a. During March 1953 to March 1954.
b. Assumes delivery of the 1.9 million tons contracted for in 1953.
c. Reported deliveries out of a total of 90,000 tons specified under the Franco-Polish commodity exchange agreement, 1 July 1952 to 30 June 1953. 160/
d. During January to June.
e. Reported deliveries out of a total of 100,000 tons specified under the proposed Chinese Communist - Polish trade agreement of 1953.
f. Estimated.
g. During October 1952 to October 1953.

company has since stated that no further sales will be made to Poland. 187/ There is, however, the possibility that a mining company which has not received US assistance may attempt to supply the balance of the ore listed under the agreement. It is also probable that Poland is attempting to secure Brazilian ore through agents in other countries, by false consignment or other devices, perhaps through West Germany.

In the light of present trends, it is likely that Poland will meet the estimated import requirements for 1955 given in Table 18.* To be sure, if Polish imports of ore from non-Communist areas were materially reduced, the USSR might be severely taxed. Considering the development of iron ore mining in the USSR, however, it is possible that even as large an amount as 3 million tons might be supplied to Poland by that country in 1955.

As far as is known, Poland exports no iron ore, and with an ever-increasing internal demand and very limited resources, it is probable that there will be no substantial exports in the future.

4. Consumption.

No reliable information is available concerning the actual iron ore requirements of Poland. An estimate has been made, however, based on the anticipated iron and steel production through 1955. The estimated production, consumption, and import requirements of iron ore in Poland during 1947-55 are shown in Table 17.**

Stocks of iron ore in Poland reportedly on hand as of 23 September 1952 are shown in Table 16.*** It is unknown whether the ore supply at the Central Reserve is considered a strategic stockpile or an inventory of ore for current use.

5. Expansibility.

Long-range expansion of the Polish iron ore mining industry cannot be justified by economic considerations when the low physical quality of the ore and the nature of its occurrence are considered. Even though the National Institute of Geology in Warsaw states that geological surveying has been inadequate, it is unlikely, in view of the geological nature of the known deposits, that further

* P. 45, below.
** Table 17 follows on p. 43.
*** Table 16 follows on p. 42.

Table 16

Stocks of Iron Ore in Poland 188/
September 1952

Metric Tons

Type of Ore	Stocks at Foundries	Stocks in Central Reserve
Krivoy Rog Ore	342,000	153,700
Swedish Ores (Including Concentrates)	273,800 a/	680,100 b/
East German Ores	16,350	39,300
French Ores	3,200	2,900
Ores from World War II Stocks	13,200	
Polish Ores	46,200	700
Total	694,750	876,700

a. Of which 5,200 tons were old stock.
b. Of which 59,400 tons were old stock.

prospecting will disclose reserves of sufficient magnitude and quality to make the country self-sufficient on an economic basis.

It appears that presently confirmed reserves will furnish low-grade ores for at least 50 years at the rate of production estimated for 1953. Domestic iron ore production in 1953 amounted to only about 26 percent of the apparent consumption. Greater significance, however, should be attached to the fact that in terms of metal, Polish ores furnished only 15 percent of the iron content. If the mines of Poland supplied 100 percent of the estimated metallic requirements of its iron and steel industry, proved and probable reserves would last only 30 to 40 years.

Table 17

Estimated Production, Consumption, and Import Requirements of Iron Ore in Poland a/ 1947-55

Year	Production (Thousand Metric Tons)	Consumption b/ (Thousand Metric Tons)	Percent of Self-Sufficiency	Import Requirements c/ (Thousand Metric Tons)
1947	324 189/	1,905	17	1,581
1948	378 d/	2,385	16	2,007
1949	420 d/	2,720	15	2,300
1950	474 190/	3,225	15	2,751
1951	540 191/	3,430	16	2,890
1952	624 192/	3,860	16	3,236
1953	660 d/	4,270	15	3,610
1954	720 d/	4,500	16	3,780
1955	780 d/	4,930	16	4,150

a. Iron content 50 percent.
b. Based on CIA pig iron and steel production estimates. Calculated on the basis of iron ore of 50 percent iron content for pig iron production, plus an allowance equal to 10 percent of the steel production, charged to steel-making furnaces as ore of 50 percent iron content.
c. It is assumed that apparent import requirements were satisfied.
d. Estimated.

E. East Germany.

1. Reserves.

The total of proved and probable iron ore reserves in East Germany has been estimated as high as 51 million tons. 193/ This figure must be accepted with caution, however, as confirmatory information is unavailable. Two-thirds of this reserve is reportedly located in the Harz Mountains area, the balance in Thuringia. 194/ Generally speaking, the iron ore of Eastern Germany is of very low iron content, for the most part ranging from 25 to 35 percent iron. It also has a high silica content, producing large quantities of slag in the blast furnaces and requiring abnormally large quantities of coke for smelting. 195/

In the past, because of common ownership with the metallurgical plants these mines were exploited despite the low grade of the ore. The present extent of ore beneficiation at the mines is unknown. It is believed that ore-dressing operations are confined chiefly to the metallurgical plants and consist mainly of crushing and sintering. The installation of low-shaft type blast furnaces was made for the purpose of utilizing finely divided ores such as those mined at Badeleben in the Harz Mountains.

The number of small producing mines and the variance in chemical composition of the ores make it difficult to fulfill the demands of the various metallurgical plants for a uniform composition of ore shipments.

2. Production.

The production of iron ore in East Germany has been accelerated in order to meet the increasing demands of the metallurgical industry. Production in 1947 is estimated to have supplied some 62 percent of domestic ore needs. In the following year, however, iron and steel production had increased to such an extent that ore self-sufficiency was reduced to approximately 35 percent. Despite expansion of ore production, the increasing demands of industry have caused East Germany to remain at about the same level of self-sufficiency from 1948 to the present.

The planned production of iron ore according to the Five Year Plan (1951-55) and also according to the plan of the Ministry

of Ore Mining and Smelting, 196/ as compared with the estimated production, during 1951-55 are shown in Table 18.

Table 18

Planned Production and Estimated Production of Iron Ore in East Germany 1951-55

Thousand Metric Tons

	1951	1952	1953	1954	1955
Five Year Plan	630	750	2,330	2,600	3,650
Plan of the Ministry of Ore Mining and Smelting	505	750	1,580	2,270	4,000
Revised Plan of the Ministry of Ore Mining and Smelting			1,340 197/	1,710 198/	N.A.
Estimated Production	490 199/	773 200/	1,218 a/	1,550 b/	1,880 c/

a. Based on 9.5 months' fulfillment of the revised Plan. 201/
b. Assuming the same degree of fulfillment of the revised Plan as in 1953.
c. Based on a production increase equal to that of the previous year.

Plan quota figures have been published in East Germany since 1948. In 1950, when the 1951-55 Five Year Plan for iron ore production was announced, the quota figures, particularly those for the last 3 years of the Plan, in no way corresponded to the available capacities of the industry. The figures represented goals, the attainment of which would require substantial investment in plant expansion.

In 1951 the production of iron ore was increased to about 490,000 tons, as compared with 400,000 tons in 1950. This 1951 output fell short of the 505,000-ton Plan of the Ministry, which in itself was a reduction of the original Five Year Plan target of 630,000 tons. 202/

Iron ore production in 1952 surpassed Plan targets by some 23,000 tons, and increased 58 percent over the previous year.

Ore production figures for 1953 begin to illustrate the fact that the production targets for the later years of the Five Year Plan were merely goals intended to stimulate industry. Actual 1953 production fell short, not only of this figure and the Plan of the Ministry, but also of the revised Ministry total of 1,340,430 tons, which appears to have been created when production shortcomings became evident. 203/

It is important to note that after the June 1953 riots, the East German Planning Commission reduced the planned investment of the metallurgical industry for the 6 months from Deutsche Mark East (DME) 789 million to DME 616 million. Within this total the iron ore industry was cut back 4 million DME. 204/ Total planned investments for 1954 have since been reduced from DME 700 million to DME 200 million, a decrease in line with the policies of the "New Course" which undoubtedly will have drastic effects on the contemplated expansion of the iron ore mining industry. 205/

The accomplishment of the planned 1954 and 1955 iron ore production appears doubtful in view of the reduced investment in the industry.

3. Trade.

According to the original statistics of the 1951-55 Five Year Plan compiled 1 October 1951 by the East German State Planning Commission, iron ore imports in 1952 were scheduled to amount to only 400,000 tons. 206/ In spite of accomplishing the production planned for 1952, domestic ore supplies were inadequate to meet the total needs of the iron and steel industry, and increased imports became necessary. Thus, the original import Plan was rendered obsolete.

During 1951, East Germany received ores from Norway and China, although, according to the information available, the total of these imports amounted to less than 30,000 tons. 207/ Under the terms of Agreement Number 1, made in 1951 between the German Foreign Trade Agency (DAHA) and the Swedish Foreign Trade Barter Corporation (SUKAB), East Germany received a total of 2,883 tons of Swedish ore. 208/ The total of iron ore received from the USSR during 1951 is unknown.

Total East German imports of iron ore from the USSR in 1952 were 1 million tons. 209/ In addition, Sweden supplied 9,000 tons during the year. 210/

The Stalin Metallurgical Plant at Fuerstenberg on the Oder, which was built to operate solely on Krivoy Rog ore, received approximately 414,000 tons of the 1952 total. 211/ The records of the plant indicate that other ores were received from Czechoslovakia and Rumania during 1952. These may also have been Soviet ores which were transported northward on the Danube. The total volume of these deliveries cannot be ascertained. 212/

Plans for 1953 called for the importation of 1 million tons of iron ore from the USSR, 213/ of which 600,000 tons were destined for the Stalin Plant. 214/ The only reported 1953 imports from the West totaled 1,335 tons -- 726 tons from India, 200 tons from West Germany, and 409 tons from Austria. 215/

As far as is known, there have been no exports of iron ore from East Germany in recent years.

4. Consumption.

The consumption of iron ore in East Germany is chiefly confined to the Stalin Metallurgical Plant (formerly the East Metallurgical Combine) at Fuerstenberg on the Oder River, the West Metallurgical Combine at Calbe, and the old German iron and steel plant, the Maxhuette, in Unterwellenborn.

The Stalin Metallurgical Plant is supplied almost entirely with ores imported from the USSR. Irregular deliveries of ore from Krivoy Rog, however, have necessitated the use of some low-grade ores from the Braunesumpf mine and the mine at Schmalkalden. 216/

The blast furnaces at Calbe are of the low-shaft type, especially designed for the smelting of finely divided ore. The principal mines supplying ore of this type are Badeleben and Buchenberg in the Harz Mountains and those at Tangerniederung. 217/

Iron ores for the Maxhuette are supplied only by the mines at Kamsdorf, Wittmannsgereuth, and Schmiedefeld in the Saalfeld mining region of Thuringia. 218/ Since these ores only average 20 to 25 percent iron content, they are first concentrated to from 40 to 45 percent iron in a direct process installation which was put into operation at the end of 1952. 219/ Formerly the mines of the Harz region provided the ores for the plant. 220/

The estimated production, consumption, and import requirements of iron ore in East Germany during 1947-55 are shown in Table 19.*

The government of the Soviet Zone of Germany has an estimated 40,000 tons of iron ore in a so-called "State Reserve." 221/ In view of the critical iron ore shortage within East Germany, it is doubtful that a substantial ore reserve could be established in the near future without increasing the apparently short supply.

5. Expansibility.

Considering the reduction of investment in the iron ore mining industry in East Germany, it is unlikely that ore production will exceed the 1,880,000 tons estimated for 1955. Although this is far below the Five Year Plan figure of 3,650,000 tons, it is doubtful that much greater output will be achieved. East Germany has only limited reserves of very low-grade ores remaining; and, as is usually the case with such ores, the iron content will further decrease as mining continues. The economic feasibility of large-scale exploitation of these reserves is questionable, and in view of recent financial cut-backs in the metallurgical industries, it appears that the 1955 Plan goal is purely visionary.

The long-range expansion potential of the iron ore mining industry of East Germany may be regarded as negligible because of the long history of exploitation and the improbability of further discoveries of economic iron ore deposits.

F. Hungary.

1. Reserves.

The iron ore resources of Hungary are very limited quantitatively as well as qualitatively. The only important iron ore deposits being worked today are at Rudabanya, Borsod County, including the neighboring Martonyi and Tornaszentandras areas. 222/ The reserves of both proved and probable ore in this district are approximately 21 million tons, of which about 9 million tons have been developed for working. 223/ The quality of this ore (22 to 31 percent iron content), however, is poor and shows signs of further deterioration in grade.

* Table 19 follows on p. 49.

Table 19

Estimated Production, Consumption, and Import Requirements of Iron Ore in East Germany a/ 1947-55

Year	Production (Thousand Metric Tons)	Consumption b/ (Thousand Metric Tons)	Percent of Self-Sufficiency	Import Requirements c/ (Thousand Metric Tons)
1947	170 224/	276	62	106
1948	160 d/	449	36	289
1949	216 d/	627	34	411
1950	240 225/	771	31	531
1951	294 226/	816	36	522
1952	464 227/	1,483	31	1,019
1953	730 d/	2,412	30	1,682
1954	930 d/	2,583	36	1,653
1955	1,129 d/	2,745	41	1,616

a. Iron content 50 percent.
b. Based on CIA pig iron and steel production estimates. Calculated on the basis of iron ore of 50 percent iron content for pig iron production, plus an allowance equal to 10 percent of the steel production, charged to steel-making furnaces as ore of 50 percent iron content.
c. It is assumed that apparent import requirements were satisfied.
d. Estimated.

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In addition to the deposits at Rudabanya, Hungary has iron ore at Nagyleta and Bagamer in Bihar County, and in the southern part of the Eperjes-Tokaj mountains. These ores do not appear to be workable, however, because of the nature of occurrence and the small size of the deposits. In the vicinity of Pecs there are limited quantities of limonite of 32 to 36 percent iron content which may be mined for smelting at the new Stalin Iron Works. 228/

Appendix B contains more detailed information on the ores of the Rudabanya district, and a list of the more important Hungarian iron ore mines and deposits with descriptive information.

An interesting metallurgical development in Hungary which may yield a substantial quantity of iron oxide is the so-called "red mud" process, which utilizes the byproduct of alumina separation from bauxite. Hungarian bauxite reserves amount to over 250 million tons and contain up to 30 percent iron oxide. Alumina is carried in solution from bauxite by a sodium hydroxide treatment, leaving an insoluble residue which, because of the color of its high iron oxide content, is called "red mud." After separating the oxide from other components of the residue, and after de-watering, the oxide is sent to a rotating kiln, from which it emerges in the form of clinkers of sufficient physical strength to be suitable for charging into the blast furnaces. 229/

It is reported that during 1952 a successful pilot plant operation was conducted by the Matthias Rakosi Combine, and the installation of large commercial-scale equipment was to have been nearly completed by the end of that year. 230/ No information is available, however, to support these claims. It is stated that the "red mud" from the alumina extraction of previous years is piled up in many 100,000-ton lots in Fejer and Komarom counties 231/; this could provide a significant quantity of basic material for iron production if the employment of the process proves to be technically and economically sound.

2. Production.

In 1950 the total output of iron ore in Hungary was about 370,000 tons, of which about 90 percent probably originated in the Rudabanya district. 232/ Between that date and mid-1952 the production rate increased little, and over-all production at the end of 1952 was only 430,000 tons. It is estimated that by 1955, as facilities for concentrating low grade ores are completed, the output of

ore suitable for smelting in the blast furnace will probably reach 510,000 tons.

The planned production and estimated production of iron ore in Hungary during 1950-55 are shown in Table 20.

Table 20

Planned Production and Estimated Production of Iron Ore in Hungary a/
1950-55

Thousand Metric Tons

Year	Five Year Plan 233/	Production
1950	1,000	370 234/
1951	1,000	400 235/
1952	1,250	430 b/
1953	1,625	450 b/
1954	2,250	480 b/
1955	c/	510 b/

a. For methodology, see Appendix C.
b. Estimated.
c. Plan terminated in 1954.

In view of past iron ore production figures and limited ore reserves, which do not appear to constitute an economic basis for large-scale development, it will be impossible for Hungary to fulfill its iron ore production plans for 1954 and 1955.

It has been reported that ore preparation plants were erected at Ozd and Diosgyor in 1949; however, the reliability of the reports cannot be ascertained, and there is no available evidence of the plants' existence. Obviously some beneficiation practices must be employed to make ores of 22 to 31 percent iron content suitable for smelting. No information is available, however, on the type of processing or on the production. The most urgent problems of the industry are to produce uniform-sized ore at Rudabanya and to blend ores of varying iron content so as to produce more uniform blast furnace burdens. 236/

If reported development work continues, "red mud" residues of current alumina production may in 1954 yield up to 60,000 tons of iron oxide of 60 percent iron content. 237/ It is doubtful that old residues will be treated, because of the difficulties inherent in new processing methods.

Hungarian bauxite production in 1953 is estimated to have been 1.2 million tons, of which 985,000 tons were exported to the USSR. 238/ In 1952, part of the bauxite being exported was first converted to alumina, leaving 200,000 tons of the oxide-bearing "red mud," of which the iron content amounted to an estimated 36,000 tons. In addition, there was "red mud" which remained after alumina separation for domestic use. 239/

3. Trade.

The Hungarian iron and steel industry is largely dependent on foreign sources for its ore supply. Domestic iron ore production in 1940 was approximately 390,000 tons, and imports amounted to 300,000 tons. 240/ Of these imported ores the major quantities were from Yugoslavia and were selected mainly because of their ease of reduction in blast furnace operations and their low transportation costs. The loss of Yugoslavia as a source of iron ore, since the Tito-Cominform break in 1948, has been a serious handicap to Hungary in achieving the pig iron and steel targets of the economic plans of the country.

In 1950, Hungarian iron ore production amounted to roughly one-third of the nation's needs; the remaining 600,000 to 700,000 tons were imported from the USSR, Czechoslovakia, and Bulgaria. 241/ The major source of imports since the loss of Yugoslavia has been the USSR.

Reported imports of iron ore into Hungary, by country, during 1951-52 are shown in Table 21,* which represents all available information on the subject.

Although no direct confirmation is available, total iron ore imports from the USSR during 1951 are estimated to have been about 600,000 tons.

An unspecified amount of iron ore was mentioned in the Hungarian-Iranian pact signed in January 1952. 242/

* Table 21 follows on p. 53.

Table 21

Reported Imports of Iron Ore into Hungary, by Country 1951-52

Metric Tons

Source	1951	1952
Sweden	32,000 243/	25,000 244/
Bulgaria	3,600 245/	13,968 246/
India	N.A.	11,200 247/
Portuguese India	N.A.	10,000 248/
USSR	176,022 a/ 249/	800,000 250/
Total	211,622	860,168

a. See p. 52, above.

The USSR is reported to have supplied 800,000 tons of iron ore to Hungary in 1952, out of total known imports of 860,168 tons.

Because of trade difficulties, the 1952-53 Swedish-Hungarian trade agreement was extended from May 1953 to 30 September 1953, with no change in the specified quantity of iron ore, 25,000 tons. 251/ An agreement between the two countries was established on 5 November 1953 which specified that Sweden was to supply Hungary with 10,000 tons of ore before 30 September 1954. 252/

Imports of iron ore from the USSR in 1953 are not known; however, they are estimated to have been on the order of 800,000 tons. The apparent required imports of ore in 1955 have been calculated at 1,397,000 tons, the bulk of which will undoubtedly be supplied by the USSR.

As far as is known, Hungary exports no iron ore at present. Because of the increasing internal demand and the very limited resources, it is unlikely that the country will have any substantial exports in the future.

4. Consumption.

The estimated production, consumption, and import requirements of iron ore in Hungary during 1947-55 are shown in Table 22.

Table 22

Estimated Production, Consumption, and Import Requirements of Iron Ore in Hungary a/
1947-55

Year	Production (Thousand Metric Tons)	Consumption b/ (Thousand Metric Tons)	Percent of Self-Sufficiency	Import Requirements c/ (Thousand Metric Tons)
1947	137 253/	716	19	579
1948	160 d/	871	18	711
1949	192 d/	878	22	686
1950	229 254/	930	25	701
1951	248 255/	980	25	732
1952	267 d/	1,033	26	766
1953	279 d/	1,088	26	809
1954	298 d/	1,295	23	997
1955	316 d/	1,713	18	1,397

a. Iron content 50 percent.
b. Based on CIA pig iron and steel production estimates. Calculated on the basis of iron ore of 50 percent iron content for pig iron production, plus an allowance equal to 10 percent of the steel production, charged to steel-making furnaces as ore of 50 percent iron content.
c. It is assumed that apparent import requirements were satisfied.
d. Estimated.

No information is available concerning the actual amounts of iron ore on inventory at the various metallurgical plants in Hungary. The actual imports in 1952 exceeded the apparent required imports about 90,000 tons, or 10 percent. This excess is the equivalent of consumption for approximately one month, however, and it might easily have been absorbed into the inventories of iron and steel producers.

Stockpiling of iron ore in Hungary is administered from Budapest by the Metallurgical Basic Materials Stockpiling Enterprise (Kohaszati Alapanyag Keszletezoe Vallalat -- KOKEV). Its functions consist of procuring and maintaining a stockpile of all basic materials needed by the industry. 256/

KOKEV maintains an iron ore stockpile near Miskolc, not far from the Miskolc-Satoraljaujhely railroad line, consisting of a constant reserve of 200,000 tons. In May 1952 the stockpile contained Hungarian, Soviet, Bulgarian, Czechoslovak, and Swedish ores. 257/

5. Expansibility.

Future developments in the Hungarian iron ore industry will be concerned primarily with the beneficiation of low-grade ore. The problems evidently either have not been solved or are still in the blueprint stage, although they were to have been worked out during the Three Year Plan ending in 1949. It is possible that modern methods of prospecting may disclose additional deposits; however, it is unlikely that any discovery would make Hungary self-sufficient in iron ore. Apparently present plans are not contingent on further ore discoveries. There was no mention of exploration in a discussion of the "Raw Materials Problems Confronting the Hungarian Metallurgical Industry" held by the Hungarian Society of Mining and Metallurgical Engineers in July 1952.

At the present rate of iron ore mining, the reserves of the Rudabanya area alone should be sufficient for about 45 years, although the quality of the ore will very likely continue to decline as indicated by recent findings. The processing of "red mud" for iron oxide shows great promise as a secondary iron source, particularly if all bauxite for export is first converted to alumina, thus leaving all the iron oxide within Hungary.

G. Rumania.

1. Reserves.

The richest Rumanian iron ores are found in the limestone ranges of the Banat area, where ores of 50-to 60-percent iron content are not unusual. The main mining operations of this area are in the vicinity of Docnecea and at Ocna-de-Fier, near

Recita in the Timisoara region. The reserves amount to 7 million tons, of which roughly 1.8 million tons are proved. 258/

Another source of iron ore is the area of Poiana Ruscai and the adjoining mountains, as well as the western part of the region of Hunedoara and the northeastern part of the region of Timisoara, all of which is called the District of Ghelari. The proved and probable ore reserves of this vicinity amount to 17 million tons and consist mainly of limonite and siderite, averaging respectively 53 and 37 percent iron.

A few relatively important iron ore mines are in the Bihor and Transylvanian ore mountains. These are mainly between Vascau and Moneasa, in the regions of Bihor and Arad. The mineral deposits consist of limonite and magnetite ores amounting to a total of approximately 1 million tons, about half of which has been developed to date.

According to a recent estimate, the total of proved and probable iron ore reserves in Rumania amounts to 29,750,000 tons of 30- to 60-percent iron content. 259/ The average iron content of the mined ore is approximately 40 percent.

Appendix B lists the names and locations of all mines and iron ore deposits known in Rumania and other pertinent available information.

2. Production.

The mining of iron ore in Rumania has increased steadily since 1929. Domestic production rose to 143,000 tons in 1939 and continued to rise under German control to a peak of 254,000 tons in 1943. Production of iron ore from Rumanian mines under Soviet influence fell in 1945, 1946, and 1947. 260/

In 1948 the ore mining industry revived, and the district of Poiana Ruscai produced 75 percent of the total Rumanian iron ore production, or about 150,000 tons. The second largest area, near Ocna-de-Fier, produced 30,000 tons in the same year. The estimated production of iron ore in Rumania during 1947-55 is shown in Table 23.*

* Table 23 follows on p. 57.

Table 23

Estimated Production of Iron Ore in Rumania a/ 1947-55

Thousand Metric Tons

Year	Production
1947	115,000 b/
1948	210,000 261/
1949	328,000 b/
1950	395,000 b/
1951	410,000 b/
1952	430,000 b/
1953	460,000 b/
1954	500,000 b/
1955	550,000 b/

a. For methodology, see Appendix C.
b. Estimated.

Although there are no specific Plan figures available for iron ore production in Rumania, the chief objectives of the Plan as to iron ore have been stated to be the development of deposits and of methods for beneficiation of ores. 262/

Considering the political pressures on the iron ore mining industry to meet the needs of the domestic iron and steel industry, it is reasonable to believe that the estimated 1955 production will be achieved. The reserves are sufficient, and mining facilities are extensive enough, to permit an increased output if development work is accomplished.

3. Trade.

The iron ore requirements of the Rumanian iron and steel industry, according to the estimates in Table 24,* substantially exceed domestic production. Under present demands

* P. 60, below.

and at the present rate of mining, Rumania is forced to import ore to the extent of about 42 percent of requirements, most of which now comes from Krivoy Rog. Ore was formerly imported from Yugoslavia.

In 1950 the total iron ore imports reportedly amounted to 250,000 tons. 263/ The USSR was apparently reluctant to export sufficient quantities, and Rumania sought ore from wherever it was available.

Little specific information has been obtained about Rumanian iron ore imports during 1951. The only Western nation known to supply ore during that year was Norway, which shipped 12,258 tons. 264/ The total imports reportedly amounted to 300,000 tons, and it is likely that the USSR supplied nearly all of that amount. 265/

According to the available reports, Chinese exports of iron ore to Rumania in 1952 were 9,495 tons, and those from India amounted to 6,800 tons 266/; however, the total tonnage of ore imported in 1952 is not known.

During the last half of 1953, Rumania is reported to have received about 30,000 tons of ore from India, 8,000 tons from Hainan, and 6,197 tons which were declared to have been shipped from Antwerp. 267/ The total tonnage of Soviet ore imported during 1953 is probably on the order of 300,000 tons.

In 1950 the reported imports of iron ore exceeded the required imports by about 90,000 tons, and in 1951 by 44,000 tons.* Presumably this surplus was applied to a working inventory of ore rather than to stockpiles; it is possible also, that a part of this ore was later transshipped by Rumania.

25X1C

25X1A [redacted] some iron ore was received from Rumania during 1952. 268/ The total volume of these shipments is unknown, but it is believed to have been small.

* Iron content 50 percent.

4. Consumption.

No information is available concerning the actual iron ore requirements of Rumania. The estimated production, consumption, and import requirements of iron ore in Rumania, 1947-55, are shown in Table 24.* There is no known stockpiling of iron ore in Rumania and no evidence of such a policy intended for the future.

5. Expansibility.

The chief deterrents to long-range expansion of the iron ore mining industry in Rumania are the wide dispersion of the ore deposits, the low iron content, and the relatively high cost of mining. Considering these factors, it is unlikely that 1955 iron ore production, despite any pressures which might be brought to bear on the industry, will exceed the estimated figure of 550,000 tons.

It is estimated that at the present rate of iron ore mining the reserves of approximately 30 million tons are sufficient to last for about 60 years. Only about half the national requirement, however, is supplied by domestic ore.

H. Bulgaria.

1. Reserves.

As far as is known, Bulgarian iron ore comes almost exclusively from the Vassil Kolarov (formerly Blagovest) mine at Krumovo, some 25 kilometers south by southwest of Jambol. 269/ The probable reserves of this area have been estimated variously from a few hundred thousand tons up to 1 million tons or more. Although the Bulgarian government conducted geological examinations in the vicinity of this mine about 1940, the results are unknown.

Iron ore deposits in the area of the Stara Planina Mountains at Chiprovska, north by northwest of Sofia, are frequently mentioned. A magnetite deposit in the area extends from the southern foothills of Yasova Mountain to Kamuk. East of it and as far as the village of Zelesna, the deposits occur up to 2 meters in thickness. In spite of these reserves, which are estimated at 1 or 2 million tons, no exploitation ever developed here in modern times, probably because the ore is contaminated with other minerals. 270/

* Table 24 follows on p. 60.

Table 24

Estimated Production, Consumption, and Import Requirements of Iron Ore in Rumania a/
1947-55

Year	Production (Thousand Metric Tons)	Consumption b/ (Thousand Metric Tons)	Percent of Self-Sufficiency	Import Requirements c/ (Thousand Metric Tons)
1947	92 271/	200	46	108
1948	168 272/	352	48	184
1949	262 d/	384	68	122
1950	316 d/	476	66	160
1951	327 d/	583	56	256
1952	344 d/	581	59	237
1953	368 d/	635	58	267
1954	400 d/	740	54	340
1955	440 d/	818	54	378

a. Iron content 50 percent.
b. Based on CIA pig iron and steel production estimates. Calculated on the basis of iron ore of 50 percent iron content for pig iron production, plus an allowance equal to 10 percent of the steel production, charged to steel-making furnaces as ore of 50 percent iron content.
c. It is assumed that apparent import requirements were satisfied.
d. Estimated.

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East of Kostenic, which is 60 kilometers southeast of Sofia on the Marica River, there is another frequently mentioned iron ore deposit. Although the mineral cannot be followed in continuous strikes, the heaviest deposits attain 25 meters in thickness. The ore is hematite and magnetite. It is far from pure, however, with up to 40 percent silica, and only 35 to 40 percent iron content. 273/

A deposit of magnetite is located on the Bedek Mountain, 1,500 meters high, in central Bulgaria, which has been prospected in only a few places between Kazanluk and Plachkovtsi. The nature and extent of reserves are not known. The district is inaccessible from the point of view of transportation. 274/

There is a series of iron ore deposits of relatively high iron content in the Strandza Mountain area in southeast Bulgaria, but they have been superficially and inadequately prospected, largely because of transportation difficulties. 275/ Reportedly the Strandza Mountain area holds the most promising prospects for exploration in Bulgaria. 276/

An interesting, and therefore repeatedly examined, iron ore deposit is the titaniferous magnetite sand deposit on the Black Sea coast near Burgas. The sand itself contains 56 percent magnetite, and the remainder is composed of silicate minerals and titanium dioxide, implying an iron content of 40 percent. 277/ It is unknown whether this deposit is currently being exploited. The dimensions of the sand zone suggest that the reserve contains up to 800,000 tons of magnetite. 278/

2. Production.

As a producer of iron ore Bulgaria ranked fourth among the five Balkan nations in 1944. Production increased from only a little over 6,000 tons in 1936 to 30,000 tons in 1940. 279/ The estimated production and consumption of iron ore in Bulgaria during 1948-55 are shown in Table 25.*

* Table 25 follows on p. 62.

Table 25

Estimated Production and Consumption of Iron Ore in Bulgaria a/
1948-55

Thousand Metric Tons

Year	Production b/	Consumption c/
1948	33	0
1949	38	0
1950	40	0
1951	40	0
1952	45	0
1953	47	2
1954	47	5
1955	48	8

a. Iron content 50 percent.
b. Estimated.
c. Based on CIA steel production estimates. Iron ore requirements based on 10 percent of estimated annual steel production, charged to steelmaking furnaces as ore of 50 percent iron content.

3. Trade.

Bulgaria, which is only beginning to develop a small steel industry, is able to supply its limited demands and therefore has no reason to import iron ore. No blast furnaces have yet been constructed.

Several thousand tons of ore were reported to have been stored on the docks at Ruse during the period July to September 1951, probably for transshipment on the Danube. 280/

As far as is known, Bulgaria imported no iron ore during 1952. Early in 1953 China is known to have shipped 16,500 tons to Stalin (Varna). 281/ Presumably this ore also was for transshipment.

In 1944 the entire output of Bulgarian iron ore was exported, principally to Hungary. 282/ The disposition of Bulgarian

ore during 1945-50 is unknown. It is considered very likely, however, that Hungary, as well as the other European Satellites which consume ore, received a substantial share during that period.

Bulgaria is reported to have exported the following quantities of iron ore during 1951: to Poland, 5,620 tons; to Hungary, 3,599 tons; to Czechoslovakia, 5,387 tons; and 905 tons to an unknown destination. 283/ It is considered probable that the balance of the iron ore production also was exported.

On 28 February 1952, Hungary and Bulgaria consummated a trade agreement whereby Bulgaria was to supply iron ores as well as other raw materials in exchange for various manufactured goods from Hungary. 284/ The amount of iron ore specified under this agreement is unknown, and no information has been received concerning actual shipments or deliveries of ore.

No information is available on Bulgarian exports of iron ore during 1953.

4. Expansibility.

It is unlikely that the iron ore reserves of Bulgaria will ever become of economic importance, either for export or for domestic consumption. All the production of the country developed to date totals only approximately 2 million tons of about 800,000 tons of iron content, one-half of this being proved and one-half probably reserves. 285/ The total reserves of the country reportedly amount to only 4 million tons. 286/

I. Albania.

Iron ores have been found in nearly all parts of Albania. The most important deposits exist in a 20-kilometer strip of land extending from Pogradec to Pishkash on the western shore of Lake Ochrida. In this area the known reserves amount to about 17 million tons of good-grade hematite ore, and there is reason to believe that the total reserves may be greater. 287/ In 1940 the Italians began development work in the area with the intention of annually producing 1.5 million tons of ore. Military events, however, interrupted the progress of the plan. 288/

It is impossible to estimate the total iron ore reserves of Albania because of the limited surveys which have been accomplished. In view of the size of the country, it appears unlikely that sizable deposits would have been overlooked. The numerous small scattered deposits, however, may contribute significantly to the total iron ore reserves.

Further information on the location of the ore deposits in the Pogradec region may be found in Appendix B.

Although Albanian iron ore deposits are virtually untouched, they should not be entirely disregarded, because both Italy and the USSR have considered them of sufficient importance to make plans for their exploitation. Italian attempts at development in 1940 included preliminary construction of an aerial iron ore conveyor system and partial completion of a railroad on which to transport ore from Labinot to the sea. 289/ Soviet geological experts are reported to have surveyed some Albanian iron ore deposits in 1949, and an announcement was made that a plant for processing and smelting the ore would be constructed. 290/ To date, however, there has been no confirmation of any mining activity.

As Albania has no iron and steel industry, there has been little reason for the Albanians to develop domestic ore resources. Under the 1951-55 Five Year Plan no mention was made of iron ore, 291/ and this may be considered indicative of the current static condition of the industry.

APPENDIX A

ORGANIZATION AND ADMINISTRATIVE STRUCTURE
OF THE IRON ORE INDUSTRY IN THE SOVIET BLOC

Country	Organization Governing Production	Organization Governing Importation of Iron Ore
USSR	Ministry of Ferrous Metallurgy Glavruda (Main Administration of the Ore Mining Industry) Giproruda (State Institute for Planning Iron Ore Mining Enterprises) controls planning and research	N.A.
Communist China	Ministry of Heavy Industry Iron and Steel Industries Office	(No Imports)
Czechoslovakia	Ministry of Metallurgical Industry and Ore Mines Main Administration of Iron Ore Mines	"Metalimex," Prague
Poland	Ministry of Mining Central Administration of Iron Metal Mines	"Minex"

Country	Organization Governing Production	Organization Governing Importation of Iron Ore
East Germany	Ministry of Ore Mining and Smelting	Ministry of Foreign Trade DIA-Metal (German Domestic and Foreign Commerce for Metal)
Hungary	Ministry of Heavy Industry	"Metalimpex," Budapest
Rumania	Ministry of Metallurgy	"Industrial Import," Bucharest
Bulgaria	Ministry of Mines and Mineral Wealth	N.A.
Albania	(No Production)	(No Imports)

APPENDIX B

DETAILED INFORMATION ON IRON ORE DEPOSITS AND MINES IN THE SOVIET BLOC

USSR: Iron Ore Deposits in Production in the USSR

Name and Location	Type of Ore	Estimated (1950) Annual Production (Metric Tons)	Remarks
North and Northwest (I)			
Pudozh Gora (62°15' N - 35°50' E) on the northeast shores of Lake Onega	Low-grade titanium magnetites. Normally contain over 25 percent iron which can be concentrated to over 50 percent iron. Estimated reserves, 92 million tons.	N.A.	Considered highly important due to its proximity to the industrial center of Leningrad, connected by rail.
South (III)			
Krivoy Rog (47°54' N - 33°21' E)	Deposits estimated to contain over 1 billion tons of ore with 50 percent iron content. Generally low in phosphorus and sulfur. Ore is mostly hematite, with lesser amounts of magnetite and limonite. Agglomeration of ores required due to large percentage of fines.	20,660,000	Predominantly underground mining but some open-pit operations. Principal source of iron ore exported to Satellites. Lowering quality of ore mined during recent years has necessitated more extensive beneficiation. Ore in form of powder averages about 50 percent of total ore mined. Physical and chemical qualities of ores vary widely from mine to mine.
Kerch' (45°23' N - 36°26' E) on eastern tip of Crimean Peninsula. Chief deposit, Kamysh Burun, south of town of Kerch'	Limonite, very powdery. Iron content varies widely, ranging from 20 to 51 percent iron, averaging 37 percent. Ore processed to yield 46 to 47 percent iron concentrate. High phosphorous (up to 2.5 percent) content, some arsenic (average 0.1 percent). Estimated reserves, 2,722 million tons.	1,960,000	Highly mechanized operations and convenient transportation by sea make these deposits the most economical to exploit of all iron ore deposits in the USSR. Planned capacity is 10 million tons of iron ore per year. Actual capacity still far short of goal.

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Name and Location	Type of Ore	Estimated (1950) Annual Production (Metric Tons)	Remarks
Transcaucasus (V)			
Dashkesan (40°30' N - 46°04' E) 30 kilometers southwest of Kirovabad	Magnetite, containing an average of 40 to 46 percent iron. Ores also contain 0.20 to 0.28 percent sulfur and 0.05 to 0.17 percent phosphorus. Ore mineral is associated with cobaltite, chaleopyrite. Estimated reserves, 190 million tons.	N.A.	Best surveyed of all USSR iron ore deposits. Only deposit in Transcaucasus capable of serving as an ore base for expanded pig iron production in the region. Ore processed to remove gangue and supply a product of constant quality.
Central (VII)			
Tula (54°12' N - 37°36' E) 160 kilometers south of Moscow	Low-grade limonite, averaging 40 percent iron content. Ore is concentrated. High in phosphorus. Estimated reserves, 192 million tons.	400,000	Three open-pit mines in operation. Ore occurs in scattered pockets. Detailed prospecting has indicated that the industrial significance of the Tula and Lipetsk deposits is small.
Lipetsk (52°38' N - 39°38' E)	Similar to Tula ore. Estimated reserves, 154 million tons.	Up to 700,000	A series of open-pit and underground operations. Largest production comes from underground mines.
Kursk (51°42' N - 36°12' E)	Two types of ore: magnetite, containing 55 to 65 percent iron, and iron quartzite, containing 30 to 35 percent iron. Estimated reserves, 336 million tons. Quartzite deposits contain 200 billion tons.	N.A.	Deposits of the region divided into 6 districts. Ore extraction should expand considerably in the near future. It is planned to ship iron ore from the Kursk area to the Donbas in exchange for coking coal. Many of the Donbas metallurgical plants are closer to Kursk than to Krivoy Rog, the present source of iron ore. Principal mine is at Korobkovsk, near Staryy Oskol. Plans call for development of a mine with a capacity of 500,000 tons per year.
Kirov (58°33' N - 49°42' E)	Large bodies of known iron ore at Klimkovo, Peskovka, Chernaya, and Kholunitsa.	N.A.	Recently developed. Ores smelted at local plants.

Name and Location	Type of Ore	Estimated (1950) Annual Production (Metric Tons)	Remarks
Urals (VIII)			
Auerbach (Rudnichnyy) (59°42' N - 60°18' E) in Bogoslovsk region.	Magnetite, 39 to 60 percent iron. Contains considerable percentages of copper and cobalt. Relatively free from harmful impurities. Estimated reserves, 15 million tons.	N.A.	New production units were opened in 1949. Metallurgical plant at Serov is chief consumer.
Mt. Blagodat' (58°16' N - 59°50' E) near Kushva	Hematite, 40 to 45 percent iron content. Ore washed and concentrated to a 57 percent iron concentrate. Titanium also extracted from this ore. Estimated reserves, 117 million tons.	1,500,000	Reportedly supplied 30 metallurgical works in the Urals with magnetic iron ores and agglomerates. Open-pit mining changing to underground operations. Reported in 1950 that crushers were too small, thus limiting production. Also reported that severe winter climate hampered operations.
Mt. Vysokaya (57°54' N - 60°00' E) near Nizhniy Tagil	Magnetite, 50 to 55 percent iron content, associated with copper ores. Estimated reserves, 129 million tons.	N.A.	Mining was to be completely converted from open-pit to underground operations by the end of 1950. The nearby mine of Lebyazhinsk is included in the administration of Mt. Vysokaya iron ore mine. Believed to be second largest iron ore mine in Urals, after Mt. Magnitnaya.
Alapayevsk (57°51' N - 61°43' E) near city of Alapayevsk (57°52' N - 61°42' E)	Limonite and siderite containing up to 46 to 50 percent iron. Also contains nickel, chromium, and copper. Estimated reserves, 143 million tons.	N.A.	Mined for over 240 years. Deposits concentrated in relatively small area. New reserves discovered recently.
Serov (59°36' N - 60°36' E)	Limonite.	N.A.	In operation. Great chemical and physical diversity in ores. Agglomeration plant in operation.
Ivdel' (60°42' N - 60°28' E) north and northwest of city of Ivdel'		N.A.	

Name and Location	Type of Ore	Estimated (1950) Annual Production (Metric Tons)	Remarks
rals (VIII) (Continued)			
Yelizavet (56°45' N - 60°38' E) in Sverdlovsk Oblast	Limonite, containing some chromium and nickel. Ore is powdery. Iron content 45.1 to 50.5 percent.	N.A.	Products treated at Nizhniy Zerginski, Staroutkinsk, Teplaya Gora, and Verkhne Ufaley. Sintering has proved to be best treatment for these ores.
Pervoural'sk (56°54' N - 59°58' E)	Titanium-magnetite, averaging 32 to 54 percent iron.	N.A.	Ore requires sorting and concentration.
Kamensk-Uralskiy (56°24' N - 61°50' E) on east slopes of Ural Mountains	Brown iron ore, ranging from 30 to 39 percent iron.	N.A.	No details available. Ore consumed by local blast furnace plant.
Kusa (55°20' N - 59°29' E)	Ilmenite-magnetite deposit, averaging 52 percent iron. Ore minerals; 50 to 5 percent magnetite, 25 to 30 percent ilmenite, with 0.3 to 1 percent vanadium oxide.	N.A.	Underground mining. New enriching plant built at the mines. Titanium ore consumed by paint factory near Zlatoust. Largest deposit of titano-magnetites in the Urals.
Zigazinskiy-Komarovo (53°51' N - 57°20' E)	Brown iron ores with average iron content of 41 percent, and about 1.2 percent manganese. Low content of sulfur and phosphorus. Estimated reserves, 226 million tons.	N.A.	Ores are concentrated. Small metallurgical plant in Beloretsk consumes most of the ore output. Future plans call for shipments of these ores to metallurgical center of Magnitogorsk.
Bakal (54°56' N - 58°48' E)	Hematite and limonite, averaging 46 to 48 percent iron. Low in sulfur and phosphorus. Estimated reserves, 174 million tons.	N.A.	Several mines contribute to total output. Mine "imeni OGPU" is most important. Ore formerly considered among highest quality in the world, but more recently iron content has been dropping and phosphorous content has been increasing. Bakal ore shipped to numerous metallurgical plants throughout the Urals. Large sintering plant in operation at Bakal.

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Name and Location	Type of Ore	Estimated (1950) Annual Production (Metric Tons)	Remarks
Urals (VIII) (Continued)			
Magnitogorsk (53°25' N - 59°06' E) Mt. Magnitnaya	Magnetite deposit containing some hematite and pyrite. Ore averages 48 percent iron; as mined 15 percent barren rock, 25 percent milling ore (30 to 40 percent iron), 60 percent smelting ore (over 50 percent iron content). Estimated reserves, 419 million tons.	6,700,000	Largest and most important iron ore mine in the Urals. Supplies ore to Magnitogorsk. Some ore shipped to Stalinsk. Discovered during World War II that only 1/4 of remaining reserves are of high quality. Remaining 3/4 have a high sulfur content and only about 30 percent Fe content, requiring costly processing. Five large concentration mills and an ore agglomeration plant are now in operation. New rich iron ore deposit found in 1944 at Gora Bogataya, southeast of Magnitogorsk. To be exploited after exhaustion of Mt. Magnitnaya.
Orsk (51°10' N - 58°34' E) Khalilovo (53°03' N - 58°33' E)	Brown iron ores, two grades, containing an average of 37 percent iron and 47 percent iron. Low sulfur and phosphorous content. Nickel, chromium, cobalt, titanium and vanadium present in varying quantities. Estimated reserves, 396 million tons.	N.A.	Novokiyevsk and Akkermanovsk (Novotroitsk) are the two principal mines. Both were in production during World War II but postwar operations are questionable. Will be source of ore for new Orsk-Khalilovo metallurgical combine.
Titangorsk (Magnitka) (55 21' N - 59°43' E) 180km north of Zlatoust	Two types ore extracted, titanium ore and magnetite ore.	500,000 tons iron ore; 1,000 to 1,500 tons titanium ore.	Underwent considerable expansion during post-World War II years. Large number of German prisoners of war used in the labor force. Open-pit operations. Only ore containing over 30 percent iron processed. Ore quality supposed to rise with increase in depth.

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Name and Location	Type of Ore	Estimated (1950) Annual Production (Metric Tons)	Remarks
West Siberia (IX)			
Gornaya Shoriya district, south of Stalinsk	Varies according to deposit.	2,800,000	Main iron ore base for Kuznetsk Metallurgical Combine at Stalinsk. Ore exists in numerous scattered deposits.
Tashtagol (52°47' N - 87°57' E) 200 km from Stalinsk	Ore contains average of 50 percent iron, traces of phosphorus, 0.03 to 19 percent sulfur. Estimated reserves, 33 million tons.	2,000,000	Large mechanized mining operations producing best iron ore in the district. Can be fed directly into blast furnace. Total output believed to include output of Sheregesk and Shalym mines, which were put into operation during Fourth Five Year Plan.
Temir-tau (53°08' N - 87°29' E)	Low-grade magnetite, averaging 48.7 percent iron, high in sulfur and zinc. Estimated reserves, 14 million tons.	N.A.	Badly depleted during World War II. Postwar operations expanded, however, indicating the possible discovery of new reserves. Ore upgraded from 48.7 percent iron to 58.9 percent iron by means of crushing, magnetic separation, and agglomeration, but the concentrate still contains 0.5 percent zinc. Major part of this ore concentrated at Mundybash plant.
Odra-bash (53°14' N - 87°22' E)	Ore contains average of 41.4 percent iron. Large reserves of rock containing 24 percent iron. Estimated reserves, 9 million tons.	N.A.	Open-cut operations. Construction of this mine was finished with great difficulty. Put into operation incomplete in 1944. Ore shipped via suspension cable cars to Mundybash concentrating plant for processing.
Tel'bes (53°14' N - 87°24' E)	Low-grade magnetite, 40 to 45 percent iron. Low content of harmful impurities.	N.A.	Chief local source of iron ore for Stalinsk before World War II. Present operations questionable.

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Name and Location	Type of Ore	Estimated (1950) Annual Production (Metric Tons)	Remarks
Kazakhstan and Central Asia (X)			
Karsakpay (47°50' N - 66°45' E)	Magnetite, hematite, containing average of about 50 percent iron content. Estimated reserves, 7 million tons.	N.A.	These are presently utilized as flux for the Dzhezkazgan copper smelting plant. Small scale, open-cut operations.
Atasuskiy (48°34' N - 70°49' E)	Hematite, 41 to 64 percent iron content. Considerable reserves. Estimated reserves, 40 million tons.	N.A.	Planned ore base for new Kazakhstan metallurgical plant.
Stalinabad (38°30' N - 68°45' E)	N.A.	N.A.	Production began in 1946. Cable railway 4.5 km long brings ore down from mine to highway.
Ayat River (52°54' N - 63°02' E) West of Kustanai	Brown iron ores.	N.A.	In operation in 1947. Open-cut operations. Possible source of iron ore for Magnitogorsk Combine, 300 km away, and other south Ural metallurgical plants. Has been reported that tremendous reserves here can serve as a source of iron ore for Urals, Kazakhstan, and Kuznetsk metallurgical plants. During 1948, ore mined was used for experimental smeltings.
East Siberia (XI)			
Balyaginskiy (51°26' N - 108°42' E)	Magnetite ores averaging about 46 percent iron content.	N.A.	Iron ore base for metallurgical plant at Petrovsk. Mine in operation since 1879. On basis of known reserves (3.5 million tons), could not support blast furnace operations for amortization period.
Angara-Ilim (57°00' N - 102°00' E)	High-grade magnetite, iron content up to 58 percent iron, low in sulfur and phosphorus. Estimated reserves, 345 million tons.	N.A.	Has greatest economic significance of all iron ore deposits in eastern USSR. Very large reserves will support any plans for new metallurgical plants in the area. Not known whether exploitation has yet gotten under way.

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Name and Location	Type of Ore	Estimated (1950) Annual Production (Metric Tons)	Remarks
Far East (XII)			
Nikolayevsk (53°08' N - 140°44' E)	Brown iron ores, 26 to 45 percent iron content. Estimated reserves, 23 million tons.	N.A.	Main source of iron ore for Amurstal plant at Komsomol'sk. Mine located within city limits. Ore enriched by washing.
Sikhote-Alin' (48°00' N - 138°00' E)	Ore believed to be high-quality. No details available	N.A.	Several small mines. Production started in 1948.
Maly Khingan (47°55' N - 131°00' E) near Ussuri railroad line.	Iron quartzites, 37 to 42 percent iron content, low in sulfur and phosphorus. Detailed prospecting not yet completed.	N.A.	Ore used for experimental processing. Being developed for large output. In future to be principal source of iron ore for Amurstal, at Komsomol'sk. Very fine crushing (therefore very costly) required in processing. Ores to be concentrated to 53 to 55 percent iron content and then agglomerated.

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Communist China: Iron Ore Reserves.

The iron ores of China fall generally into four categories, as follows:

(1) Southern Manchuria and Northeast Hopeh Province. Metamorphosed sedimentary type of ore with siliceous layers of magnetite and hematite. Generally 35 percent iron content, nearly 50 percent silica, and low sulfur and phosphorus. Occasionally pockets of 50 percent or greater iron content are also found.

(2) Chahar Province. The second type consists of bedded oolitic ores, as exemplified by the Chahar hematite ores which contain 48 to 60 percent iron, 11 to 18 percent silica, 0.12 percent phosphorus, and negligible sulfur. The P'ing-hsiang hematites of Kiangsi province also belong to this category but represent basic ores with 50 percent iron and 1 percent phosphorus. Similar low-grade materials are found in Hupeh and Hunan provinces, while poor-quality siderites, generally with objectionable phosphorus content, occur in Szechwan.

(3) Shansi Province. The third type is formed by sedimentary rocks containing nodular masses of hematite, limonite, and siderite. The principal deposits are located in Shansi, where picked ore averages 50 percent iron and 0.2 to 0.5 percent phosphorus. Similar ores occur in Honan, Hupeh, Shensi, and Shantung Provinces.

(4) Hupeh, Shantung, and Anhwei Provinces and Hainan. The fourth type, which includes many of the major deposits as far as quality is concerned, consists of the contract metamorphic ores. The best examples are Ta-yeh in Hupeh, Ch'in-ling-chen in Shantung, Shih-lu on Hainan, and the Anhwei deposits. Most of these ores contain 50 to 65 percent iron, 10 to 15 percent silica, medium phosphorus, and an unobjectionable quantity of sulfur.

Principal Iron Ore Deposits of China Proper and Manchuria a/*

Thousand Metric Tons

Province and Mine or Deposit	Reserves, Production, b/ and Characteristics of Ore	Remarks
Manchuria		
Liaoning Kung-ch'ang Ling (41°07' N - 123°29' E)	Reserves: rich ore, 24.3 million; lean ore, 729.2 million. Production: 1943, 924,100. Hematite and magnetite ore. Lean ore averages 34 percent iron; rich ore averages 48 to 62 percent iron.	Main source of rich ore for An-shan works, 55 km distant. Partly open-cut. Bulk of mechanized equipment removed by USSR, but manual labor can still produce large quantities. Large resources of lean ores can be concentrated at high cost, but they never have been worked. Potential capacity can be increased to 1 million tons of high-grade ores.
Miao-erh-kou (41°07' N - 123°49' E)	Reserves: rich ore, 9.8 million; lean ore, 823 million. Production: 1943, 1,034,000. Magnetite ore. Lean ore averages 34 percent iron; rich ore averages 63 percent iron.	Main source of rich ore for Pen-ch'i works, 22 km distant. Rich lenses of ore found in large but low-grade deposit. Mined from both surface and underground. Nearly equal volumes of lean and rich ore must be extracted, although no concentration facilities now exist. Partially stripped by USSR together with other mines in the Pen-hsi-hu area. Estimated 1950 production, 500,000 tons.
Ta-li-tzu-kou (41°47' N - 126°49' E)	Reserves: rich ore, 84 million; lean ore, large. Production: 1943, 523,800. Hematite, limonite, and magnetite ore. Rich ore averages 50 percent iron.	Together with Chi-tao-kou, probably most productive area in China. 530 km from An-shan.
Chi-tao-kou (41°27' N - 126°23' E)	Reserves: rich ore, 27 million; lean ore unknown. Production: 1943, 326,200. Hematite and magnetite ore. Rich ore averages 40 to 50 percent iron.	See above. 460 km from An-shan.

* Footnotes follow on p. 78.

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Principal Iron Ore Deposits of China Proper and Manchuria a/
(Continued)

Province and Mine or Deposit	Reserves, Production, b/ and Characteristics of Ore	Remarks
China Proper		
Chahar		
P'ang-chia-pao (Lung-yen) (40°38' N - 115°31' E)	Reserves: rich ore, 200 million; lean ore, unknown. Production: 1944, 900,000. Hematite ore. Rich ore averages 52 to 60 percent iron. Present annual rate of production may be 80,000.	Aside from some local smelting toward the end of the war, ores were sent mostly to Japan and Anshan.
Yen-t'ung-shan (40°39' N - 115°04' E)	Reserves: rich ore, 42 million; lean ore, unknown. Production: 1944, 600,000. Hematite ore. Rich ore averages 47 percent iron.	Together with Lung-kuan mine, this mine constitutes one of the 3 largest high-grade deposits in China. Partly surface mined. See above.
Hupeh		
Ta-yeh (30°13' N - 114°51' E)	Reserves: rich ore, 29.8 million; lean ore, unknown. Production: 1942, 1,454,800. Hematite and magnetite ore. Rich ore averages 55 to 60 percent iron.	The best iron deposit in central China. Accessible to Hankow and Shanghai markets. Mined by low-cost open-cut methods but surface ores (half of total) gradually being depleted. Has long history of exporting of ore to Japan, although local furnaces operated intermittently. Has limited smelting facilities now, but is logical iron and steel center in central China.
Kwangtung		
Shih-lu (Hainan) (19°15' N - 109°01' E)	Reserves: rich ore 100 million; lean ore unknown. Production: 1943, 394,000. Hematite ore. Rich ore averages 60 to 62 percent iron.	The most important high-grade ore deposit in South China. Accessible to Canton area and foreign ships. Developed by Japanese. Ores mined mostly by open-cut methods at low cost.
T'ien-t'u (Hainan) (18°18' N - 109°01' E)	Reserves: rich ore, 3 million; lean ore unknown. Production: 1943, 918,500. Hematite ore. Rich ore 40 to 70 percent iron.	Near Yu-lin harbor. Presumably source of limited tonnage of Hainan ores now being shipped to European Satellites. Said to have resumed operations in late 1950. May soon lose its significance as ores are greatly depleted.

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Principal Iron Ore Deposits of China Proper and Manchuria a/
(Continued)

Province and Mine or Deposit	Reserves, Production, b/ and Characteristics of Ore	Remarks
China Proper (Continued)		
Anhwei		
Ma-an-shan (31°28' N - 118°30' E)	Reserves: rich ore, 11.2 million; lean ore, unknown. Production: 1942, 1,482,000. Hematite ore. Rich ore averages 55 to 62 percent iron.	Medium-size high-grade deposit mined by open-cut methods for export to Japan. Rate at which it was mined by Japanese could exhaust reserves in 10 years.
Shantung		
Chin-ling-chen (36°53' N - 118°09' E)	Reserves: rich ore, 13.7 million; lean ore unknown. Production: 1943, 250,100. Hematite and magnetite ore. Rich ore averages 55 to 58 percent iron.	Of four minor fields, largest from point of view of both past production and reserve. Medium-size high-grade deposit, 290 km from Tsingtao. May be important to Tsingtao if market for iron products can be found there. Local smelting furnaces and those at Tsingtao were geared for export. Ores mined chiefly from shafts. Said to have resumed limited operations in 1950.

a. Significant iron ore centers of Communist China only. For further discussion of these and other mines and deposits, consult 292/.
b. Expressed in metric tons.

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Czechoslovakia: Iron Ore Mines and Deposits, by Provinces.

Slovakia.

The iron ore deposits of Slovakia occur in the southeast in a mineralized zone about 10 kilometers long in the vicinity of Kosice in the Spisska-Gemerska mountain range. The ore body consists mainly of siderite, altering to limonite at the surface. Siderite veins ranging in width from 1 to 30 meters are mined at depths down to 300 meters. The average grade of ore shipped is 32 to 38 percent iron, 6 to 10 percent silica, 0.01 percent phosphorus, and 2 percent manganese. Beneficiation is carried on at the principal installations, with calcination of siderite increasing the iron content from 42 to 48 percent, and manganese to 2.6 percent. The iron ore deposits in this province normally supply plants at Moravska Ostrava and Trinec in Moravia and Podbrezova (Trisovec) in Slovakia and are favorably situated for rail transport.

Iron Ore Mines and Deposits in Slovakia

Name of Mine	Location
Roznava	48°40' N - 20°32' E
Vlachovo	48°47' N - 20°25' E
Dobsina	48°49' N - 20°22' E
Zeleznik	49°06' N - 21°30' E
Stefana Mine	
Antalka Mine	
Koterbachy	48°53' N - 20°41' E
Pantorocka Shaft	
Nova Shaft	
Bana Lucia	48°35' N - 21°10' E
Huta Maria	48°55' N - 21°00' E

Bohemia.

The main iron ore deposits of Bohemia are located in the Nucice-Zdice basin. Near Nucice the ore beds attain a maximum thickness of 40 meters, and from there they pitch out gradually to the east and west. At Zdice, 20 kilometers to the southwest, the ore occurs at the surface with a maximum width of 11 meters. The ore is principally a ferrous silicate, but in places it alters to limonite. It is described as a chamoisite but actually differs from this mineral by its high siderite content. The ore mined averages 32 to 35 percent iron, 12 to 13 percent silica, 2.5 percent phosphorus, 0.35 percent sulfur, and 0.05 percent manganese. It is either calcined at the mines to raise the iron content to from 42 to 45 percent or is shipped direct.

In addition to the Nucice-Zdice deposits, a workable body of hematite occurs near Krasna Hora. The average grade of ore shipped contains 34 percent iron, 15 percent silica, and 1.5 percent phosphorus. At Vlastejovice, 70 kilometers southeast of Prague, there is a deposit of magnetite; its present condition, however, is unknown. Many parts of Bohemia contain highly silicious ores, but their value is questionable. The Bohemian iron ore deposits are accessible to rail transport and normally supply plants within the province.

Iron Ore Mines and Deposits of Bohemia

Name of Mine	Location
Nucice	50°01' N - 14°14' E
Zdice	49°54' N - 13°59' E
Krasna Hora	49°36' N - 15°28' E
Mnisek	49°25' N - 20°43' E
Vlastejovice	49°44' N - 15°12' E
Pilsen	49°45' N - 13°22' E

Moravia.

The principal iron ore deposits of Moravia consist of magnetite lodes situated near Sternberk (49°44' N - 17°18' E) in the northeastern part of the region. The magnetite deposits are located close to railroads, and the ore normally supplies Moravian plants.

Poland: Iron Ores of the Czestochowa - Wielun and Kielce - Radom Mining Areas.

The Czestochowa region extends in a northwest direction from near Zawiercie through Czestochowa to the vicinity of Wielun. In the south the strata containing the iron ore beds have little width and are up to 60 meters in thickness; to the north the known width is several kilometers and the total thickness ranges up to 130 meters. The ore of the region is mostly siderite, which occurs as lumps or nodules in sands and clays. The iron content ranges from about 25 to 37 percent and the ore mined has averaged slightly over 30 percent. It may be raised to from 40 to 45 percent, however, by calcination. In a summary of field work conducted in 1947 by the Polish Geological Institute, the lateral extent of a near-surface ore horizon containing concretions of siderite was reported to be much greater than was previously assumed, and although no quantitative results are known, this discovery may be the reason for a reported expansion of mining activity in the region.

The Kielce region lies between Kielce and Radom along the northerly slopes of the Swietokrzyskie Gory (Holy Cross Mountains). The iron ore strata occur in an extensive series of sediments -- clays, limestones, and sandstones -- overlaid by 8 to 10 meters of soil. In general the ores are sideritic, but occasionally limonite and hematite are also present. With few exceptions the iron content of the ore mined is from 29 to 34 percent, and has a very high combined silica and alumina content, ranging from 17 to 29 percent. The iron content of the ore may be raised by calcination to between 35 and 40 percent. In mining these ores it has been impossible, in spite of fairly great vein thicknesses, to overcome the difficulties resulting chiefly from the physical quality of the ores. Great expense is involved in stripping the overburden and later removing associated clay from the mineral, drying under cover or in drums, and finally calcining. Although mining conditions are slightly better in the Kielce region than in the Czestochowa region, mining costs are high in view of the nature of the deposits.

Iron Ore Mines in Poland

Name of Mine	Location	Remarks
Pawel Mine VI	50°02' N - 19°46' E	Siderite ore.
Boleslaw Mine	50°18' N - 19°29' E	
Cecylia	50°27' N - 19°08' E Mierzecice	Limonite ore.
Seget Mine	50°27' N - 18°52' E Tarnowskie Gory	
Jan-Wlodowice	50°33' N - 19°27' E Wlodowice	
Panki Mine	50°35' N - 18 45' E	Loamy siderite ore.
Teodor Mine	50°41' N - 19 09' E	Improbable that it is being worked at present. In 1946, 3,200 gallons of water per minute inflow due to earth faults.
Ludwik	50°41' N - 19°09' E	Average 38 percent iron.
Zarki Mine	50°41' N - 19°09' E	Siderite ore. Average 37 percent iron.
Jan-Odkrywki	50°41' N - 19°09' E	Siderite ore.
Maszynowy No. 3	50°41' N - 21°04' E	Siderite ore.
Maszynowy No. 2	50°44' N - 19°08' E	Siderite ore.
Wlodzimierz	50°44' N - 19°08' E Mynek area	Loamy siderite ore. Average 29 percent iron.
Walenty Mine	50°45' N - 19°03' E Wies Wygoda	Siderite ore. Average 34 percent iron.
Karol Mine	50°46' N - 19°05' E	Siderite ore.
Wolnosc Mine	50°48' N - 15°05' E Kowary	Hematite ore. Production capacity estimated 40 to 50,000 tons per year.
Pawel Mine No. V	50°48' N - 19°03' E	Average 32 percent iron.
Staszyc Mine	50°52' N - 21°06' E Rudki	Siderite, magnetite, hematite, and pyrite ore.
Zebiec Mine	51°00' N - 21°09' E	Limonite ore.
Mikolaj	51°08' N - 21°06' E Tychow Stary	Limonite ore.

Iron Ore Mines in Poland
(Continued)

Name of Mine	Location	Remarks
Strzelnica	51°08' N - 21°04' E	Limonite ore.
Czerwona	51°08' N - 21°04' E	Limonite ore.
Majowka Mine	51°08' N - 21°04' E	Limonite ore.
Kutery Mine	51°08' N - 21°04' E	Limonite ore.
Zjednoczemie Mine	51°08' N - 21°06' E Tychow Stary	
Bozy Dar Mine	51°22' N - 20°48' E Koryciska	Limonite ore.
Maria Mine	53°38' N - 18°14' E Laziec	Loamy siderite ore. Average 32 percent iron.
Josef	50°25' N - 18°40' E	
Tadeusz	50°45' N - 19°40' E	

Iron Ore Deposits and Mines in East Germany

Name of Mine	Location	Type of Ore	Production (Metric Tons)	Reserves (Metric Tons)	Remarks
Schmalkalden (Stahlberg, Klinge, and Arminius)	50°43' N - 10°27' E Thuringia	Manganiferrous. Iron Ore Average 22 percent iron	Quota for February 1952, 44,650		
Am Buechenberg	51°46' N - 10°48' E Elbingerode, Northern Harz Mountains	Hematite and limonite 30 to 40 percent iron; magnetite 60 to 75 percent iron.	Capacity as of March 1950, 1,500 per month		Mine not fully developed in 1950.
Braunesumpf	51°47' N - 10°57' E Huttenrode, Northern Harz Mountains	Averages 30 percent iron.			
Schmiedefeld	50°32' N - 11°13 ' E	Siderite 20 to 40 percent iron.	9,000 (March 1950)	6,500,000	
Huttmannsgereuth	Thuringia, 3 miles west-southwest of Saalfeld	Siderite 22 to 35 percent iron.	2,690 (January 1948)	6,700,000	
Kamsdorf	Grosskamsdorf and Kleinkamsdorf. Thuringia, 4 miles east of Saalfeld	Iron-bearing limestone.			
Saalfeld	Thuringia, 25 miles south of Weimar, on northeast slope of Thuringian forest	Iron-bearing limestone, approximately 20 to 25 percent iron.			

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Iron Ore Deposits and Mines in East Germany
(Continued)

Name of Mine	Location	Type of Ore	Production (Metric Tons)	Reserves (Metric Tons)	Remarks
Schleiz	50°39' N - 11°22' E Thuringia, 15 miles west-northwest of Plauen	Averages 27 percent iron.			Actual mining to begin in 1953.
Badeleben	52°07' N - 11°07' E Harz Mountains	Bog iron ore. Averages 25 percent iron.	17,796 (January to June 1952)	1,125,000	Ore may be concentrated to 40 percent iron.
Tangerniederung	52°26' N - 11°47' E	Bog iron ore	8,071 (January to June 1952)		
Kuhschnappel	50°48' N - 12°38' E Saxony				Scheduled completion 195
Ohrsleben	52°05' N - 11°01' E Saxony Anhalt				Scheduled completion 195
Sommerschenburg	52°09' N - 11°07' E Harz Mountains			8,000,000	Production scheduled for late 1952.
Eisleben	51°32' N - 11°33' E Saxony-Anhalt. Eastern foot of lower Harz Mountains				
Ilmenau	50°41' N - 10°54' E Thuringia, 20 miles south-southwest of Erfurt				

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Hungary: Iron Ores of the Rudabanya Area.

At the end of World War II, limonite of about 32 percent iron content was being mined; however, in July 1952 the quality of the ore had declined to an average of 30 to 31 percent iron. Siderite mined in 1952 contained only 22 to 23 percent iron and also contained 17 to 18 percent barite (barium sulfate) which clogs the blast furnace and slows down reduction processes. In addition, Rudabanya contains another kind of siderite which has about 22 percent of associated silica. The general disadvantage of the Rudabanya ores is their variable iron content, especially that of siderite, which contains from 7 to 35 percent iron and from 0 to 46 percent barite. Another great disadvantage is the lack of uniform particle size, the ore ranging from large lumps to fine sands.

Iron Ore Mines and Deposits in Hungary

Name of Mine	Location	Type of Ore	Production (Metric Tons)	Reserves (Metric Tons)	Remarks
Rudabanya District	48°20' N - 20°36' E (Near Miskolc and Czechoslovak border)	Siderite, average 22 to 23 percent iron. Limonite, average 30.5 percent iron.	270,000 tons 1949.	24,000,000 tons (estimated 1947)	Sole important iron ore mining area in Hungary.
Tornaszentandras (Ostramos)	48°30' N - 20°50' E	Limonite, 35 percent iron.	8,000 tons 1949.	100,000 tons	Mining procedure is so complicated that costs are excessive.
Meszes	48°26' N - 20°48' E				
Alsotelekes	48°24' N - 20°40' E				
Peneszlek	47°37' N - 22°09' E (Near Rumanian border)				
Nyiracsad	47°36' N - 21°58' E (Near Rumanian border)				
Pecs Area	46°09' N - 18°25' E	Limonite (32 to 36 percent iron)			Test drillings have been repeatedly performed. Deposits of good quality ores have been found in several places. May have considerable importance.

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Iron Ore Mines and Deposits in Hungary
(Continued)

Name of Mine	Location	Type of Ore	Production (Metric Tons)	Reserves (Metric Tons)	Remarks
Ozd	48°13' N - 20°18' E	60 percent iron.	12,000 tons per year.		
Diosgyor	48°06' N - 20°44' E	60 percent iron.	6,000 tons per year.		
Szarvasko	47°59' N - 20°20' E (in Bukk Mountains)				

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Iron Ore Deposits and Mines in Rumania

Name of Mine	Location	Type of Ore	Production (Metric Tons)	Reserves (Metric Tons)	Remarks
Ghelari	Hunedoara Region				
Ghelari	45°43' N - 23°48' E	Limonite siderite 34 to 54 percent iron.	30 to 40,000 tons per year	2,900,000 positive 2,600,000 probable	Mined for Hunedoara Plant.
Hunedoara	45°39' N - 22°47' E				
	Timisoara Region				
Ocna-de-Fier	45°21' N - 21°47' E	Low-grade limonite and hematite 40 to 50 percent iron.	18 to 34,000 tons per year	155,000 positive 500,000 probable	Mined for Recita Iron and Steel Plant. Ore nearly exhausted.
Recita	45°18' N - 21°54' E				
Docnecea Area	45°16' N - 21°46' E				
Julia Mine		37 percent iron.			
Peter Paul Mine		41 percent iron.			
Istran Mine		57 percent iron.			

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Iron Ore Mines in Bulgaria

Name of Mine	Location	Type of Ore	Production (Metric Tons)	Reserves (Metric Tons)	Remarks
Vassil Kolarov	42°15' N - 26°35' E near Kromovo	Hematite, 61 to 64 percent iron (low sulfur and phosphorus)	1941 estimated 25,000	Possibly 1,000,000	Active since February 1949. 2,000 workers.
Samokov	Western Bulgaria, 27 miles south-southeast of Sofia	50 percent iron			At one time flourished as iron mining center.
Kremikovtsi	20 km northeast of Sofia				

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Albania: Iron Ore Deposits.

Iron-bearing strata exist in east central Albania beneath surface limestone in a 20-kilometer strip from Pogradec to Pishkash on the western shore of Lake Ochrida. The ore of these strata is largely black or brown oolitic hematite of 50 to 60 percent iron mixed with magnetite, and reserves are estimated at 17 million tons.

APPENDIX C

METHODOLOGY

1. USSR.

The most recent official iron ore reserve estimates for the USSR are those issued by the Union Geological Fund (VGF) of the USSR in 1938. New estimates and refinements of old estimates of iron ore reserves undoubtedly have been made, particularly for some of the lesser known deposits, but information in regard to any revisions of the 1938 and 1939 figures is almost completely lacking.

Iron ore production estimates for the USSR, given in this paper, fall into three categories: estimated total production figures, estimated regional production figures, and estimated mine production figures. The estimated total production figures for the years 1951 through 1955 were derived by interpolation based primarily on the 1950 Plan figure for iron ore production (which reportedly was achieved) and on an estimate of 1960 iron ore production based on pig iron production in the USSR, made by I.P. Bardin. 293/ These estimates have been converted to denote ore in terms of 50-percent iron content for purposes of consistency. Other than the 1950 Plan figure, there are no actual statistics available for current total iron ore production in the USSR. The Fifth Five Year Plan (1951-55) gives an over-all percentage increase figure for iron ore production capacity, but the manner of wording and a lack of definition render this figure meaningless.

The estimated regional production figures were obtained by the combined utilization of documented data and published percentage figures. The same method was used to obtain the estimated mine production figures. For both the regional and mine production figures, 1950 was used as the base year, since it was the final year of the Fourth Five Year Plan, and more information was available for that particular year.

Trade estimates, in some cases, were gained by adding tonnages of reported shipments of iron ore to the Satellite countries. Where such information was lacking, use was made of reported trade agreements regarding iron ore shipments between the USSR and the Satellite

countries. The trade information, however, is probably incomplete. Any estimates drawn from such information may be subject to a fairly wide range of error.

2. Satellites.

The iron ore deposits of each of the Satellites were studied first in order to establish the principal producing regions, the nature and extent of the iron ore bodies, and to establish a basis by which later production information might be better evaluated. Reserve estimates were found to be quite constant. Many estimates were based, however, on pre-World War II determinations. It should be noted that although several sources of information on reserves usually were available for each of the Satellites, it was felt that in some instances the reserve estimates may have originated from the same mineral surveys, tempered to some degree by individual considerations. Reports of the extent of individual iron ore deposits often varied greatly and necessarily were judged from the point of view of the accuracy of other data supplied by the same source.

Iron ore production estimates were developed from documentary production reports, by extrapolation from past production data, from current intelligence reports, and by derivation from estimated iron and steel production. Production estimates for each of the Satellites were developed as follows:

Communist China - Methodology given in footnote to Table 7.

Czechoslovakia - Production estimates for 1953 through 1955 were derived by extrapolation from the report of 1952 Czechoslovak iron ore production issued by the (West) German Institute for Economic Research. Annual increment projections of 300,000 tons, equal to the 1951-52 production increase, were employed for the 3-year period.

Poland - Iron ore production estimates for the period 1953 through 1955 were derived by extrapolation from a report of 1952 Polish iron ore production issued by the American Embassy, Warsaw. Annual increment projections of 100,000 tons, approximately equal to the 1951 and 1952 production increases over preceding years, were employed for the 3-year period.

East Germany - Methodology given in footnote to Table 18.

Hungary - The estimates of Hungarian iron ore production given for 1950 and 1951 are from the direct sources indicated. Estimates of production for the years 1952 through 1955 were derived by extrapolation from the 1951 figure.

Rumania - Production estimates for the years 1952 through 1955 were progressively increased by multiples of 10,000 tons to a likely production of 550,000 tons in 1955. The increase will result from moderate improvements in mining and beneficiation practices.

Bulgaria - The quantity of iron ore produced in Bulgaria is uncertain. Estimates are based on the 1940 production with expansion to 1955 amounting to only 18,000 tons. In view of the insignificant ore requirements and limited exports of Bulgaria, the estimates presented in Table 25 are believed to be within reasonable limits.

Apparent required iron ore imports were calculated as the difference between the estimated apparent consumption and the estimated iron ore production for each country in the Soviet Bloc. The methodology employed in estimating consumption may be found in the footnotes to the tables. Actual reported exports and imports of iron ore were obtained basically from CIA sources, supplemented by those reports which were available during the course of writing. In some instances it was necessary to base trade figures on the average number of tons per month indicated in the source reports, since no direct values were obtainable for an entire 12-month period. In no case, however, was an annual total calculated from quarterly reports or individual shipments, since no justification existed for such assumptions.

APPENDIX D

GAPS IN INTELLIGENCE

1. USSR.

The main gaps in intelligence are as follows:

a. Detailed information on beneficiating plants, especially their capacities, the grades of ore being processed, and any proposals for the construction of new beneficiating plants.

b. Statistics for the period since World War II concerning refinements of estimates of reserves at the well-known deposits, and estimates for newly discovered deposits.

c. Detailed information on the quality of ores and the estimated reserves at the Kursk Magnetic Anomaly, the Titangorsk deposits, the Ayat River deposits, the Abakan deposits, the Angara and Ilimisk deposits, and the Maly Khingan deposits.

d. Detailed information on iron ore production in the Ural Mountains.

e. Detailed information on trade in the Soviet Bloc.

2. Satellites.

The main gaps in intelligence are as follows:

a. Information on currently operating mines, their beneficiation facilities, and their respective productive capacities. This is especially needed in the cases of China, Hungary, Rumania, Bulgaria, and Albania.

b. Information on present reserves, the types of ores now being mined, and exploration for new sources of ores.

c. Information on trade in iron ores. Such information, while apparently complete for Polish, Czechoslovak, and East German imports,

was fragmentary for the other Soviet Bloc countries, particularly so on inter-Satellite ore shipments.

d. Information on requirements, consumption, and distribution within each of the Satellites.

e. Information on stockpiling and inventories in all the Satellites except Poland and Hungary.

APPENDIX E

SOURCES AND EVALUATION OF SOURCES

1. Evaluation of Sources.

a. USSR.

The information utilized in the preparation of the section on the USSR in this report was derived from many sources, of which the following were of the greatest value:

(1) CIA OO and SO sources.
(2) Army, Navy, and Air documents.
(3) Russian journals and periodicals via [redacted] reports.
(4) CIA FDD documents [redacted]
(5) State Department documents.
(6) Prisoner-of-war interrogations.
(7) US publications.
(8) German documents.

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The CIA sources were of value in that they supplied much of the up-to-date information contained in this report. The Army, Navy, and Air documents provided information which varied in value but was usually reliable. Of special value was [redacted] an extensive report on iron ore mining in the USSR. Information from Russian language journals and periodicals made available through [redacted] reports, while scanty, often proved to be of great value in answering key questions pertaining to the industry. State Department documents also were beneficial in this respect. NIS 26 offered considerable basic information which was fairly reliable. The prisoner-of-war interrogations varied widely in utility and reliability but did provide bits of information concerning operations in areas about which little or nothing was known. US publications and sources contained only a minimum quantity of information relating to the USSR which was not already available through other sources. Captured German documents released abundant background material which is believed to be reliable, but coverage includes only a limited area of the USSR.

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b. Satellites.

The principal sources utilized in the preparation of the sections of this report dealing with the Satellites were as follows:

(1) Various US government unclassified publications.
(2) CIA, SO, and OO documents.
(3) State Department documents.
(4) Army and Navy documents.

The CIA and State Department documents, which comprise the greatest number of listed sources, provided the bulk of the information of recent date. Excellent basic material was provided by various US government publications; much of this material was not readily available elsewhere. Reports of captured German military documents appeared to be reliable and thorough; however, these were dated before 1943 and were therefore of value only as reference works and in the compliation of the tables of deposits and mines. In the preparation of the Communist China section of this report, NIS-39, Section 63, furnished basic information which was reliable. The other reports mentioned provided reliable facts and data which were essential to support and expand the substance of the paper.

2. Sources.

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff

officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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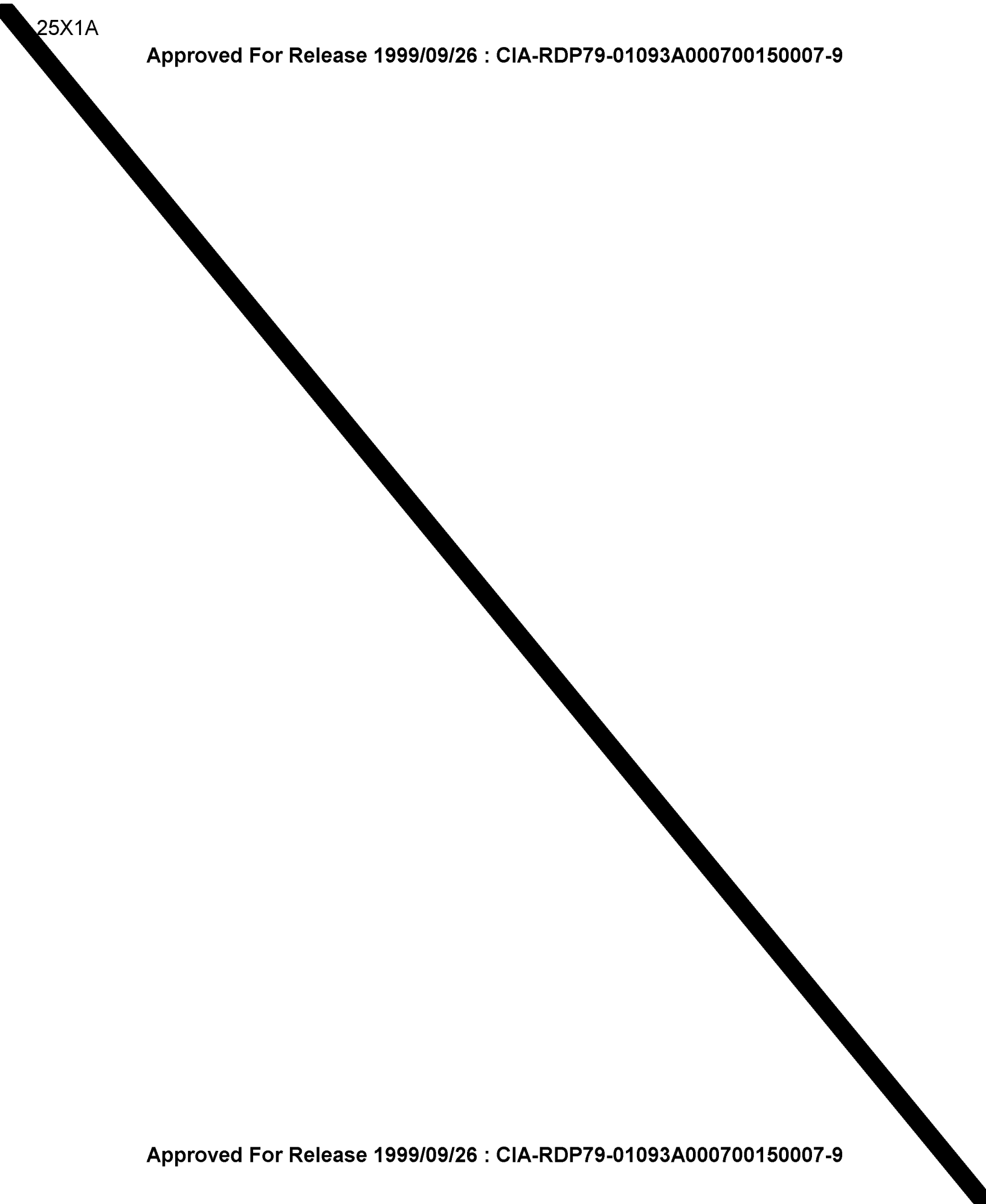

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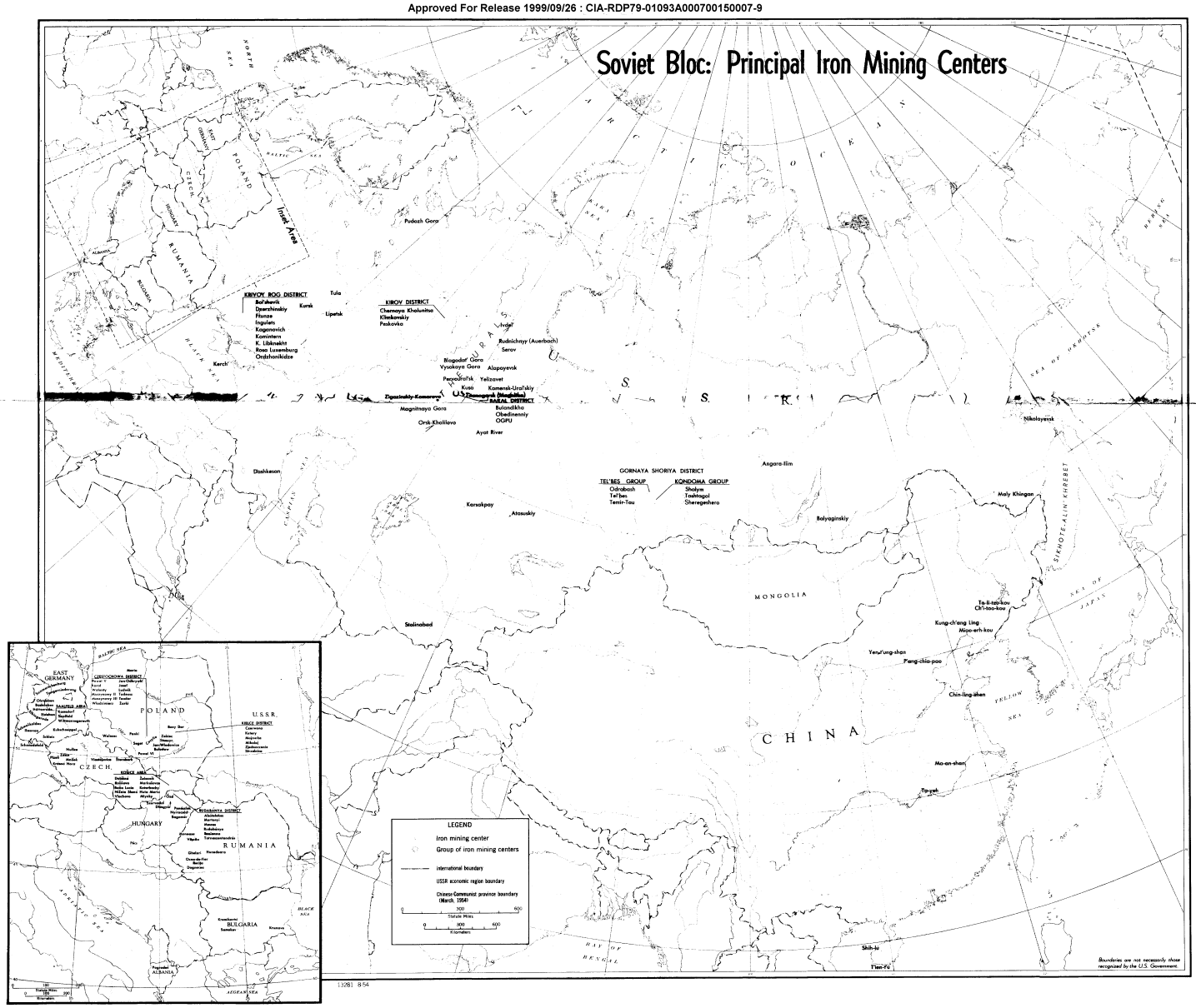

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